



# SMITHSONIAN ZOOGOER

Published by **FRIENDS OF THE NATIONAL ZOO**  
JULY | AUGUST | 09


## Coral: Living COLOR

- » Special VET Stories
- » Call of the KALAHARI
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And lots of hard work.  
But it's simply the right thing to do.

The truth is, we have always been green. Fujifilm was the first private company in Japan to create a public trust fund for the environment and we have won Japan's Energy Conservation Prize eight years in a row. And that's just part of the story.

No matter what it takes, our decision is simple. We're green because it's the right thing to do.

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MIKE HENLEY/NZP

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Although it's not easy living in the extreme landscape of Africa's Kalahari, some fascinating wildlife thrives there.




# SMITHSONIAN Zoogoer



is the dedicated partner of the Smithsonian's National Zoological Park. FONZ provides exciting and enriching experiences to connect people with wildlife. Together with the Zoo, FONZ is building a society committed to restoring an endangered natural world. Formed in 1958, FONZ was one of the first conservation organizations in the nation's capital.

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**On the cover:** Corals are marine animals, and they are essential to ocean life. Photo by Meghan Murphy/NZP.



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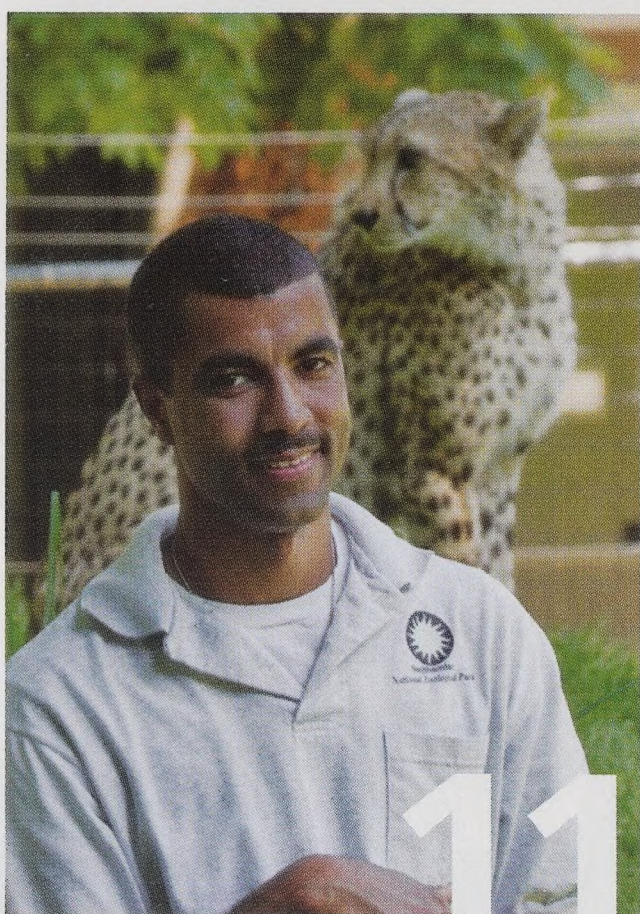


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## QUEST FOR SUCCESS

### I STILL RECALL MY FIRST VISIT TO THE SMITHSONIAN AS A CHILD IN 1967.

We took an autumn drive from Virginia into Washington, D.C., and I remember feeling awestruck by the sights I saw at the museums that day. I never dreamed then that one day I would work at the Smithsonian Institution, but here I am—the acting director of the Smithsonian's National Zoo.

While I'm new to this position, I'm certainly no stranger to the National Zoo. I first came to the Zoo during the summer of 1985 as a FONZ veterinary intern, and I've been a member of the Zoo family ever since. Over the following years, I received my doctorate studying Eld's deer reproduction, worked as the Conservation and Research Center's (CRC) clinical and research veterinarian, and served a year-long stint as science advisor to the Smithsonian's under secretary for science.

During my tenure with the Zoo's Conservation and Science Directorate, I've overseen CRC's renaissance and refocused science under the broad umbrella of conservation biology. And as part of our leadership team, I've helped develop and implement the Zoo's strategic and facilities master plans; established new and exciting partnerships with Zoo, conservation, and educational organizations; successfully fundraised for high priority programs and projects; and strategized for how to sustain vital Zoo operations and core programs in a challenging fiscal climate.

When former director John Berry made his first address to the staff as the National Zoo's new director in 2005, he declared that excellence in conservation and science were central to validating our claim of being the "Nation's Zoo." The Zoo owes John Berry a tremendous debt of gratitude for his vision and enthusiasm, but above all, for allowing us to dream how we could live up to our potential for becoming a truly great zoo. I wish John great success in his new position serving our nation as the director of the U.S. Office of Personnel Management.

Current economic malaise aside, the news about the health of our planet and its imperiled wildlife and habitats seems even worse. Fortunately, our Zoo team is populated with people who believe that they can make a difference in ensuring the survival of species and the habitats they require. Of course, animals are our highest priority, but what sustains me against all odds is our people—optimists, champions, and heroes for conservation—who inspire me to believe that we can rise to meet whatever challenges face us.

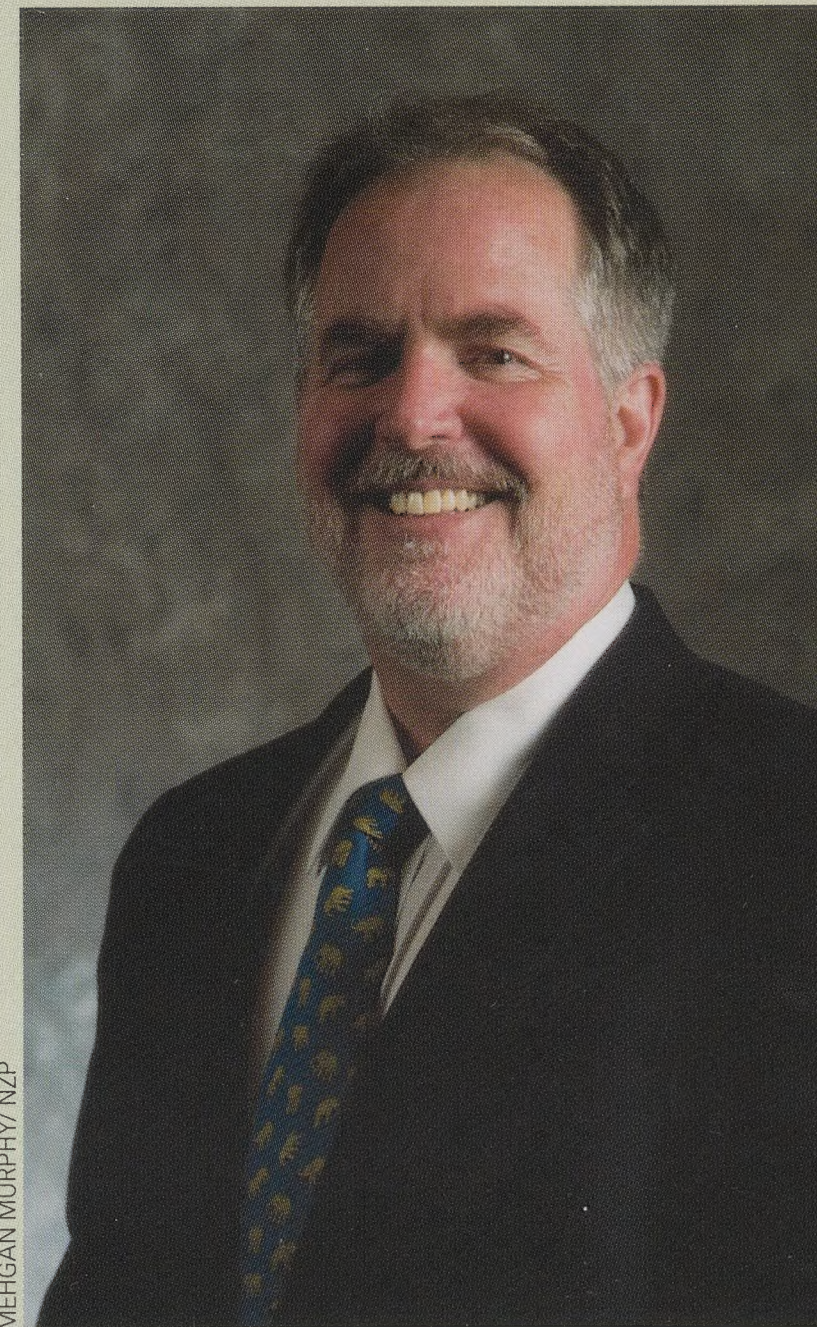
Our recent successes give us great cause to be optimistic: the flurry of animal births; launching a major initiative to save dozens of endangered frog species in Panama; and making significant progress in providing a world-class home for our beloved seals, sea lions, and Asian elephants. In my 23 years at the National Zoo, I've never been more confident that we are on track for long-term success. I am humbled and honored to lead us in our continued quest to be a great zoo distinguished by excellence in animal care, education, science, sustainability, and visitor experience.

Sincerely,



Steve Monfort

Acting Director, Smithsonian's National Zoological Park



MEGHAN MURPHY/NZP



## COME AND SEE AT THE ZOO

**“SOMETHING TELLS ME IT’S ALL HAPPENING AT THE ZOO.”**

**—SIMON AND GARFUNKEL**



Visit the Smithsonian’s National Zoo any day this summer and you have the feeling that the lyrics of Simon and Garfunkel’s playful song are being lived out right before our eyes. We recently celebrated the arrival of several babies, from giant elephant-shrews, a wattled crane, greater rheas, and more youngsters are on the way. We’ve watched the climbing antics of Billie Jean, the young female spectacled bear, who has been paired with our male spectacled bear, Nikki. The good news keeps coming—there is clearly “something happening” every day at the Zoo.

On the people side, we have a new arrival, too: Greg Melanson joined us in June as the new deputy director of Friends of the National Zoo. Greg comes to FONZ with a solid understanding of the Zoo, having served already as a FONZ board member. His background in the fields of management and finance and his work with nonprofit organizations will be invaluable in advancing the Zoo and FONZ.

Greg demonstrated just how willing he is to get to work even before his first official day on the job—he volunteered to operate the cotton candy machine at our Guppy Gala event. It’s one of the stickiest jobs around, and he handled it with characteristic cheer. I know he’ll bring the same positive energy to his new job as well.

We had a busy spring with some of our most popular events. We were glad that the rains held off until the end of ZooFari, allowing guests to enjoy the fine cuisine, wine, and entertainment that make this our most delicious evening event. The weather was even better for Guppy Gala, when the kids got their turn to take over the Zoo and enjoy a wide range of activities, games, food, and performances.

We also have plenty happening with our animal exhibits. This fall, we will open the first phase of our Elephant Trails exhibit. Elephant Trails will include expanded and enriched habitat, improved viewing areas, and will underscore our strong commitment to do all we can do help save Asian elephants. Also taking place this fall: ground-breaking for the two-year, \$28 million redesign and refurbishment of the seal and sea lion exhibit. When completed, the exhibit will include new above-water and underwater viewing areas, wave pools, and a new interactive zone.

It’s all happening at the National Zoo, as we move from strategic planning to implementation of our two approved master plans for both our Rock Creek and our Front Royal, Virginia, campuses. These efforts set the stage for the forward direction we will be taking. I encourage you to review them in detail at [www.fonz.org/masterplan.htm](http://www.fonz.org/masterplan.htm).

As the Zoo undergoes a leadership transition, the organization remains in very capable hands. Acting director Steve Monfort is committed to moving us forward, and he is working diligently to execute all the elements needed to expand and intensify the institution’s local, national, and international impact.

Thank you for all your help. Your support is crucial as we continue to improve and grow, ensuring that good things continue happening at our Zoo.

Sincerely,

Bob Lamb

Executive Director, Friends of the National Zoo



ANIMAL  
NEWS

## FAREWELL TO HAPPY ...

This fall, the Smithsonian's National Zoo will bid adieu to Happy, our **Nile hippopotamus** (*Hippopotamus amphibius*). Although we will be sad to see him go, we expect that he will be "Happier" as he joins other hippos in a larger exhibit at his next home.

Happy is the 22nd hippo born at the Zoo and will follow in the footsteps of his relatives that have relocated to other zoos. Across North America, these hippos are helping to inspire and educate people about wildlife. They often move between zoos so they can live and breed with each other.

Why does Happy have to move? Mainly, he needs larger pools and more land. Also, hippos are social animals that live in herds. We want Happy to be able to live in the company of other hippos, and maybe even become a father someday. Providing him with that type of life at the National Zoo could cost more than \$50 million, and right now, the Zoo is committed to other major projects. One of these projects is a \$25 million fire prevention and safety program that will help safeguard our animals, visitors, and staff. We're also

improving many exhibits and creating Elephant Trails, a new habitat for Asian elephants.

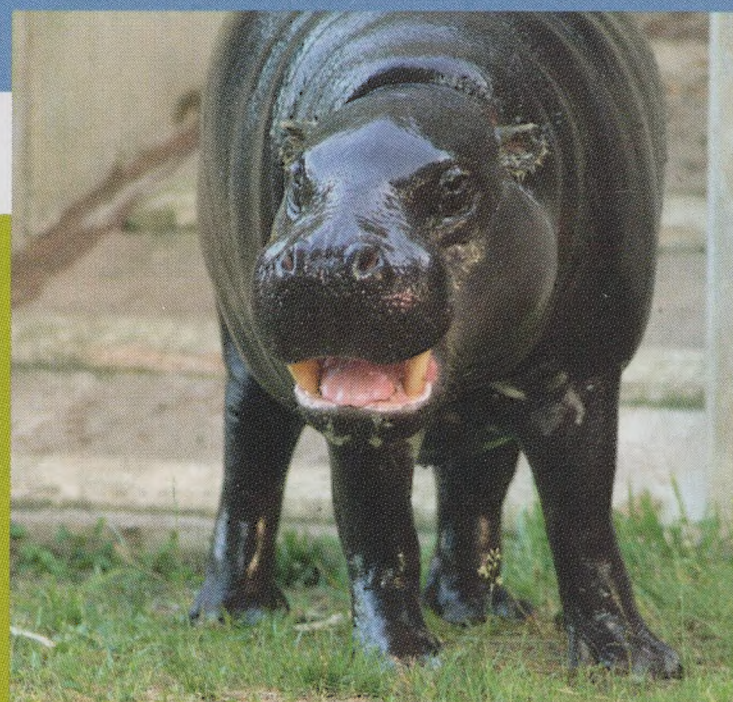
If you've visited Happy's exhibit lately, you probably noticed the large crate that was placed in the outside yard by Zoo staff. Crates such as this one are used to safely move animals between zoos. To ensure Happy's move is as smooth as possible, we are familiarizing him with the crate, slowly training him to voluntarily go inside.

As much as we'd love to keep Happy, we know he needs a new and bigger exhibit. We will miss Happy, but we're doing what is best for him. We hope you are able to visit him before he leaves.

## ... AND FRIENDS

Happy isn't the only hippo traveling to a new home. So are the Zoo's two **pygmy hippos** (*Hexaprotodon liberiensis*), female Agnes and male Pogo. Agnes's new home is at Six Flags in Vallejo, California, while Pogo is now at Miami Metro Zoo in Florida.

The Zoo's first pygmy hippo, Billy, arrived at the National Zoo in 1927; it was given as a pet to President Calvin Coolidge. The Zoo has been instrumental in the Association of Zoos and Aquariums' Species Survival Plan for pygmy hippos. Since 1929, 58 pygmy hippos have been born at the Zoo, and we have sent these animals to zoos all over the world.



The other Elephant House residents, the Zoo's two male **capybaras** (*Hydrochaeris hydrochaeris*)—which look like giant guinea pigs—are also moving out during Elephant Trails construction. Their new home is the Chattanooga Zoo in Tennessee.





## COUNTING OUR CHICKS

**A** hard-earned friendship between crane and human led to a recent hatching from what is currently the world's most genetically valuable **white-naped crane** (*Grus vipio*).

Only a few thousand of these cranes exist in the wild, making the genetic diversity of the captive population paramount. That's why the new mother's genes, which have never before been passed on to a chick, are so important.

The catch is that this stunning 20-year-old crane, Amanda, doesn't consider herself a crane. She imprinted onto humans as a young hatchling and prefers her keepers to other cranes. So the Smithsonian's National Zoo's Conservation and Research Center changed tactics. Her favorite keeper, Chris Crowe, slowly earned Amanda's trust—playing with her, sitting with her, adapting her to his presence and touch—and was eventually able to successfully artificially inseminate her without using restraints or anesthesia, producing a tiny, downy female hatchling.

The baby is doing well so far, raised not by her mother—whose preference for humans might have endangered the chick's health—but by her grandparents.

But white-naped cranes aren't the only cranes making comebacks at the Zoo. A **wattled crane** also hatched recently, making her one of the few surviving wattled chicks in the Zoo's history.

For now, the chick is still a downy gold, and her wattle (the fleshy fold of skin hanging from the throat) is barely the size "of a split pea," says primary keeper Debra Talbott. By winter, she will have begun to shed her down for the black, white, and gray feathers characteristic of adults. Both adult cranes care for the chick, and despite their six-foot-tall size, they're gentle parents, scouring the earth for tubers and worms, and patiently lowering meals one cricket at a time to their baby.

Wattled cranes (*Buggeranus carunculatus*) are a vulnerable species—according to the


International Crane Foundation, only about 8,000 survived in the wild as of 2002. They're native to the wetlands of southern and central Africa; industry, agriculture, and river management have contributed to the loss of their natural habitats. The National Zoo is just one of three zoos across the nation to breed these stately birds.



MEHGAN MURPHY/NZP

White-naped crane

## FOUR NEW GREATER RHEAS

**hatched at the Zoo recently under the watchful eye of their father. The greater rhea (*Rhea americana*) is native to South America and is a member of the group of large, flightless birds known as ratites, which also includes the emu and ostrich. As in the wild, the rhea father has taken on all parental duties, nurturing and protecting the three female and one male hatchlings, puffing up his feathers whenever intruders—even other rheas—draw too near.** 



MEHGAN MURPHY/NZP

## EXHIBIT NEWS

The first phase of **Elephant Trails** is on track to be completed later this fall. The elephants will be off exhibit for a period, getting acclimated to the changes. You'll be able to see them enjoying the new section of their expanded habitat by late fall.

Come see the **seals and sea lions** this summer before construction begins in the fall on their new, exciting exhibit. Parts of Beaver Valley will be closed throughout the renovation.

Amazonia's new **Amphibian Alert!** exhibit showcases fascinating frogs and other amphibians, while teaching about what's being done to protect these creatures.



**T**wo baby black and rufous giant elephant-shrews (*Rhynchocyon petersi*) recently

emerged from their nest in their exhibit at the Zoo's Small Mammal House. Miniatures of their parents in shape and coloring, the babies are growing quickly and appear healthy. Like all black and rufous giant elephant-shrews these young had remained hidden for the first three weeks of their lives—keepers estimate they were born in late April. After they mature, the new elephant-shrews will be moved to a separate exhibit away from their parents.

Native to eastern Africa—Kenya, Tanzania—giant elephant-shrews aren't actually shrews. They're considered part of a superorder, the Afrotheria, a category they share with several other species, including the armadillo, sea cow, and elephant. These newest elephant-shrews are the ninth and tenth babies born at the Zoo since the female arrived here in 2006.

Many litters of black-footed ferrets kits have been born this year. (Kits pictured here were born last spring.)



MEHGAN MURPHY/NZP



**You might have a clowder of cats, or a gaggle of geese—but if you had enough ferrets,** like the National Zoo does this year, you'd have a business of ferrets on your hands. More than 30 black-footed ferrets have been born this year, with more expected at the Zoo's Conservation and Research Center. Most of the kits were the result of natural breeding, but some are products of pioneering reproductive science. Zoo scientists artificially inseminated four female ferrets with frozen-thawed semen collected from males as far back as 20 years ago. Black-footed ferrets (*Mustela nigripes*) are an endangered species, only 800 ferrets are believed to exist in the wild. Artificial insemination with frozen semen allows conservationists to bring invaluable genetic diversity to ferret populations in captivity, maintaining the health of the species.



MEHGAN MURPHY/NZP

**Matchmakers at the National Zoo successfully introduced a pair of spectacled bears (*Tremarctos ornatus*) to one another this spring.**

Zookeepers had drawn up a month-long, four-stage plan to familiarize the Zoo's 17-year-old male, Nikki, with three-and-a-half-year-old female Billie Jean, a playful female bear who arrived at the Zoo last December. But the introductions went so well that keepers decided to let the bears meet face to face less than three weeks into the plan. The bears immediately hit it off, says keeper Tracy Barnes, and keepers are hoping that the pair will be ready to produce cubs soon.

Spectacled bears are so named for the white or cream fur framing their eyes. They're native to South America, and the species is vulnerable to extinction in the wild.





ANN BATDORF/NZP

## SAVING TIGERS

The Smithsonian Institution and The World Bank Group have announced a new program under the Global Tiger Initiative to help stabilize and restore wild tiger populations and save this endangered species from extinction in its natural habitat.

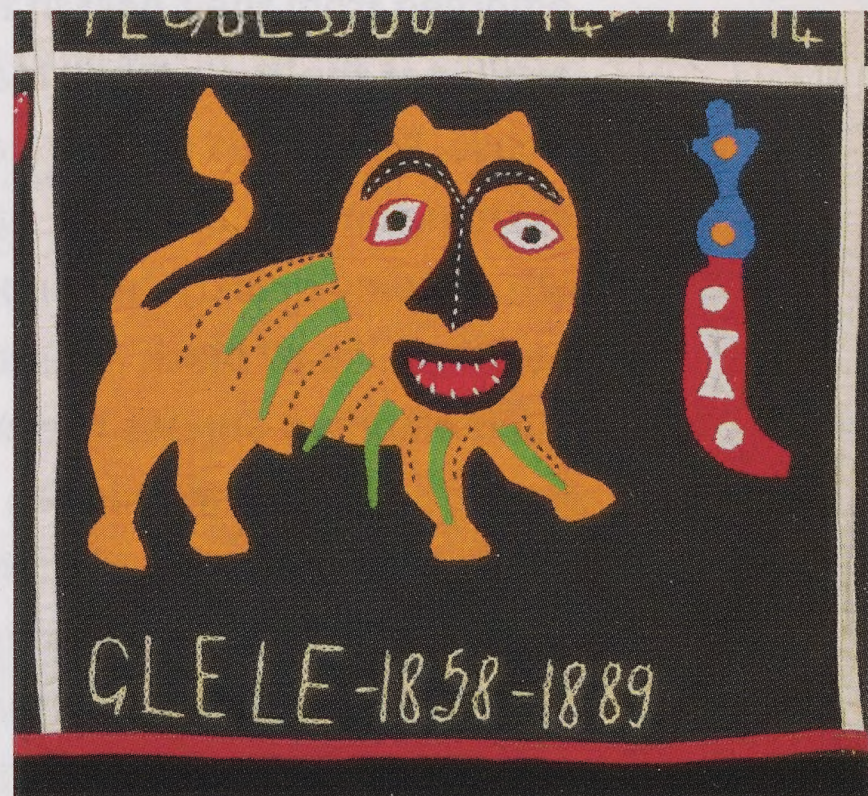
Through this partnership, The World Bank and the National Zoo will work with a number of other conservation organizations to train a network of habitat managers in wild tiger conservation. The two organizations will dedicate more than \$1 mil-

lion over the next year toward these training efforts, with the goal of expanding the alliance to include other members and leverage additional financing.

For more information about the Global Tiger Initiative, visit [www.GlobalTigerInitiative.org](http://www.GlobalTigerInitiative.org).

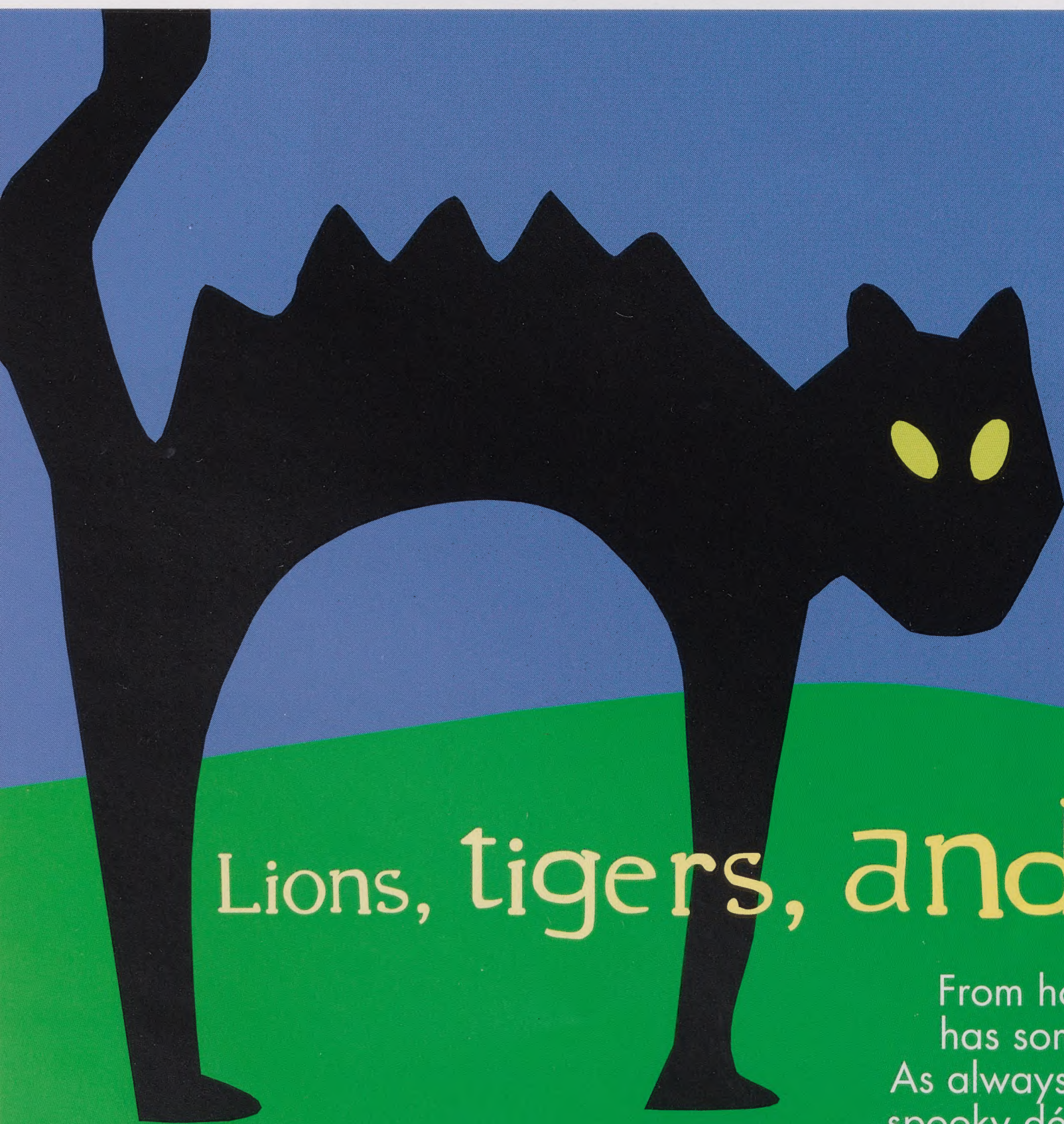
## Artful Animals

The Smithsonian's National Zoo has teamed up with the National Museum of African Art, National Postal Museum, National Museum of Natural History, and the Discovery Theater to present the animals of Africa as they appear in traditional and contemporary African art. Beginning this July, "Artful Animal" signs will appear at several Zoo locations—lions, scimitar horned oryx, Bird House, chameleons, Gabon viper, and orb weaver spider—with images of the animals as they appear in African art.



FRANKO KIHOURY/NATIONAL MUSEUM OF AFRICAN ART

There will also be an African drumming group performance at one of the Zoo's Sunset Serenades concerts (July 23) to round out the cultural festivities.



## Boo at the Zoo

October 23, 24, & 25, 2009  
members \$15, nonmembers \$25

# Lions, tigers, and Scares!

From hoots and howls to feathers and fun, Boo at the Zoo has something for little kids, big kids—and the kid in you. As always, you'll find tons of tasty treats, animal encounters, spooky décor, and safe trick-or-treating. Tickets go on sale at [www.fonz.org/boo.htm](http://www.fonz.org/boo.htm) on August 20 for members, and September 3 for nonmembers. Treat your family to a most unforgettable howl'oween event!



## AN ELEPHANT-SIZED GIFT

Students from the Washington Hebrew School (pictured here with FONZ Executive Director Bob Lamb) held bake sales, saved pennies, and ultimately raised \$500 to buy an engraved brick for the National Zoo's new Elephant Trails exhibit. The money will help support construction of the Elephant Exercise Trek, part of Elephant Trails.



MATT PETROS

## SPEAKING OF ELEPHANTS ...

Check out the most recent Spotlight on Vet Medicine to learn about a fascinating case involving our elder Asian elephant Ambika. Visit <http://nationalzoo.si.edu/goto/vetmedicine>.

## WELCOME ABOARD

FONZ welcomes **Gregory J. Melanson** as its new deputy executive director. Melanson brings 25 years of experience in finance, fundraising, and public relations to this position. He has worked for Bank of America and related organizations since 1984, most recently as the senior vice president of Bank of America's Community Development Banking, Atlantic region. Melanson is already familiar with the Zoo, having served as a member on the Board of Directors of FONZ for two years. He is also a member of the U.S. Environmental Protection Agency National Environmental Justice Advisory Council, in addition to several other community committees in the region. His extensive expertise in leadership and financial analysis will prove invaluable for his new role at FONZ, where he will oversee the budget, human resources, and a staff of more than 300 employees.



MEGHAN MURPHY/NZP

Book a venue  
where there's lots of  
howling, whooping,  
and hooting.

Even before it's filled  
with your guests.

Bring your party animals to the National Zoo. There's no better place to host a corporate event for your clients and colleagues. Book now for the holidays—or any occasion. Reserve your spot today by calling 202/633-3045. Your guests will go ape over it.





## Mark Your Calendar

- July 9, 16, 23 Enjoy **Sunset Serenades**—free outdoor evening concerts at the Smithsonian's National Zoo  
[www.fonz.org/sunsetserenades.htm](http://www.fonz.org/sunsetserenades.htm)
- August 20 Get a taste of microbrewed beers, food, and fun at **Brew at the Zoo**  
[www.fonz.org/brew.htm](http://www.fonz.org/brew.htm)
- August 22 Learn, play, and support elephant conservation at **Celebrate Asian Elephants**  
[www.fonz.org/events.htm](http://www.fonz.org/events.htm)

## Connect With Us

Want to receive the latest information from Friends of the National Zoo?

Provide FONZ with your current email address, and we will send you twice-monthly electronic newsletters, member email updates, and other Zoo news. Please visit

[www.fonz.org/memberemails.htm](http://www.fonz.org/memberemails.htm) to sign up for emails.

**SCOUTING FOR CELL PHONES** Cub Scout Pack 55, in Virginia, is helping the National Zoo recycle old cell phones. Cell phones contain coltan, a mineral that is mined in Africa, causing damage to gorilla habitat. Recycling phones reduces the need to mine for coltan.

Working cell phones collected by the Scouts or turned in to the Zoo's

Visitor Center will be refurbished and donated to low-income families here and abroad. The Zoo also receives funds for recycled phones, which support the Zoo's work in wildlife conservation. Non-working cell phones will be recycled under EPA guidelines, keeping hazardous materials out of our landfills.

**WE WANT TO HAVE  
YOU FOR A TREAT**

A spooky new adult event is coming to the National Zoo this Halloween.





## COOL CAT

**B**iologist Craig Saffoe watches over five of the sleekest, fastest predators at the Smithsonian's National Zoo as they romp and play just a few feet away—with no bars or walls separating him from them. He dreamed of this job ever since he was in high school, when he first marveled at how the cheetah hunted its prey alongside lions twice its size. "I wondered what made them tick," he explains. "I wanted to know how they do what they do so well."

Saffoe has spent his 15-year tenure at the Zoo investigating just that—how cheetahs and the other 12 species at the Cheetah Conservation Station and Asia Trail exhibits thrive. A day's work can include feedings, enclosure repairs, veterinary visits, yard cleaning, and enrichment—but "there's no such thing as a typical day," he assures.

From inside the cheetah yard, Saffoe chats with visitors about cheetahs' social structure, hunting techniques, and, of course, speed. Visitors won't see cheetahs chasing down gazelles as they would in the wild—they mostly eat beef prepared by the Zoo's nutrition staff.

To give the cheetahs a chance to practice their hunting skills, Saffoe starts a mechanism that zooms a white flag from one end of the largest enclosure to the other at 40 miles per hour. As the cheetah follows in hot pursuit, its body quickly twists and turns to closely stalk and capture the flag. It's an enrichment activity for the cheetah, but it also demonstrates the cat's stunning speed to visitors.

The cheetahs are fed every day in holding yards behind the scenes. During feeding time, keepers get a chance to get up close and personal with the cats. Saffoe looks over each cheetah thoroughly to assess behavior and health daily.

The result of those feedings—the poop—is one of the greatest indicators of an animal's overall health and, in some cases, its readiness to breed. Saffoe and other biologists at the Zoo routinely monitor the hormone levels in cheetah feces. By traveling to zoos all across North America, they determine how to best manage the animals and yield successful births.

Their research paid off in 2004, when Tumai gave birth to the Zoo's first-ever litter of cubs. "That birth was one of the best and most significant moments of my career," he says. "I will never forget it." Tumai bonded with her four cubs (two boys and two girls) and reared them herself. When the cubs turned one month old, Saffoe was one of the first to hold them.

But for this cool cheetah expert, his most important duty is "helping people have an affection for these animals," Saffoe says. "They are in danger of extinction, but there are steps we are taking now to stop the decline and ensure the survival of this amazing cat."

— JENNIFER ZOON



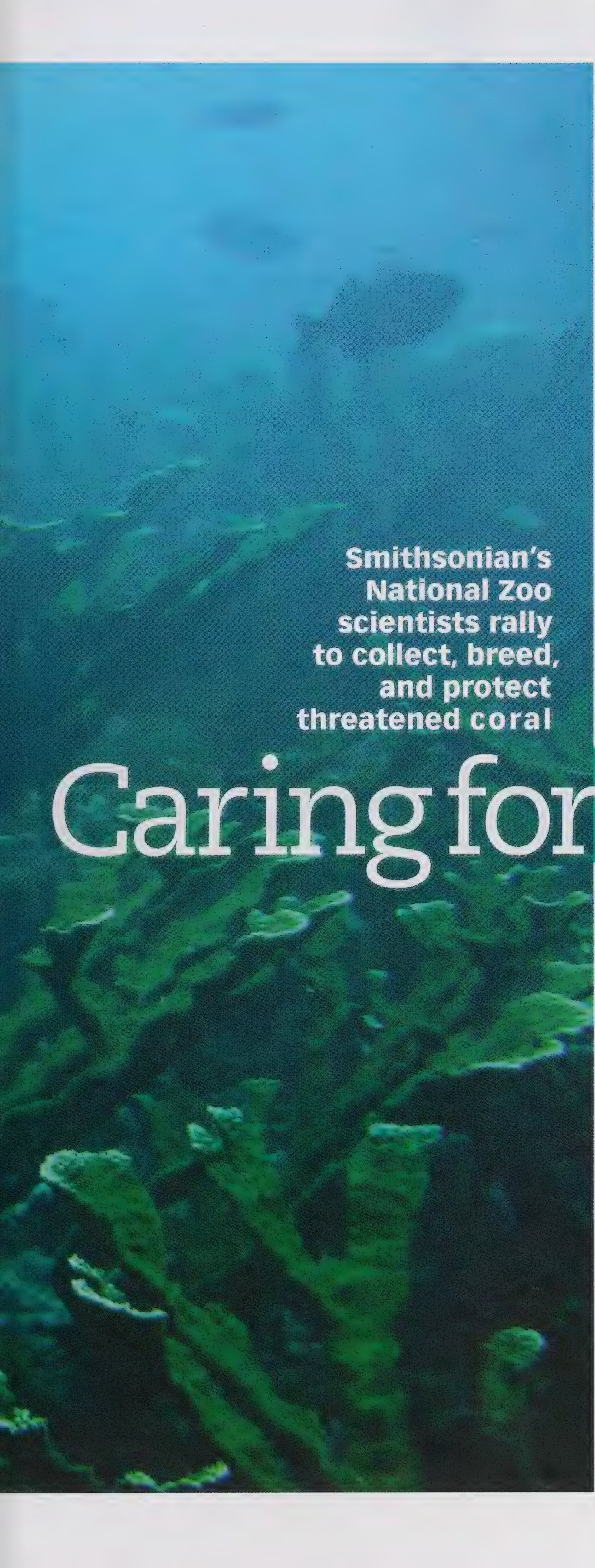
JESSIE COHEN/NZP

» In each issue of *Smithsonian Zoogoer*, this "How Do You Zoo?" page will showcase someone who works at the National Zoo. Learn more about careers at the Zoo by visiting the How Do You Zoo? exhibit in the Zoo's Visitor Center. Children ages five to ten can get a hands-on feel for different jobs at the Zoo. The exhibit is open most weekends from 10 a.m. to 4 p.m.









Smithsonian's  
National Zoo  
scientists rally  
to collect, breed,  
and protect  
threatened coral

# Caring for Coral

BY DAN STONE

## ONCE A YEAR, PART OF THE OCEAN

near Rincon, Puerto Rico, experiences an underwater blizzard. It happens at night, four days after the first full moon in August. Just 15 feet offshore, hundreds of elkhorn coral (*Acropora palmata*) release thousands of tiny white bundles into the water. This submerged hailstorm of reproductive material is a natural phenomenon few people will ever get to see.

National Zoo marine biologist Mary Hagedorn and invertebrate keeper Mike Henley are two of the lucky ones. Together with a group of scientists, they have traveled to Rincon over the last few years to scuba dive and collect the tiny gametes, or egg-sperm bundles, while the coral spawned. "The white bundles were everywhere—I could barely see a few feet in front of my face," Henley says. "I've never seen anything like it."

Hagedorn and Henley's work in Rincon is part of a program called SECORE (SExual CORal REproduction, [www.secore.org](http://www.secore.org)), which was initiated by the Rotterdam Zoo in the Netherlands. SECORE was set up to study coral sexual reproduction and to develop breeding techniques that can be shared by wildlife organizations around the world.

ILLIANA BAUMS/PENN STATE UNIVERSITY



# Caring for Coral

## Coral and People

“Coral reefs are some of the oldest and most diverse ecosystems on the planet,” says Hagedorn. “Although they cover less than one percent of Earth’s surface, one-fourth of all marine life depends on them.” But more than wildlife relies on reefs; people do, too. Across the globe, millions depend on reefs for food. Ten percent of the world’s fish harvest and 25 percent of developing countries’ fish come from reefs.

Reefs provide other services as well, such as protection from storms and erosion. Equally important, reefs are a source of potential antibiotics and medicines. Chemicals from a Caribbean sponge are used to create the HIV-AIDS drug azidothymidine, or AZT. Reefs also offer a sanctuary to snorklers and scuba divers, who are drawn to their beauty and magnificence.

“Reefs are the rainforests of the sea, and coral are like the trees,” says Henley.

“But the difference is that rainforests are plant-based ecosystems, while reefs are animal-based ecosystems. After all, coral are animals.”

## Local Impacts on Reefs

Despite their critical role in aquatic ecosystems and human survival, coral are disappearing all over the world. A number of scientists predict that some coral species may become extinct within ten to 30 years. Both local and global stressors are having a negative impact on coral reefs. “One problem is the local abuse of reefs, which includes people stepping or walking on reefs,” says Hagedorn. “And in some places they actually use dynamite to blow up the reef to hunt for fish. Coral doesn’t recover well from these kinds of abuses.”

Another threat is sedimentation, which results from poor land-use practices such as deforestation from coastal construction projects. During construction, forests of

mangroves and other fauna are wiped out, permitting sedimentation and other runoff to enter the sea. When the soil settles on a reef, it can smother coral by blocking out sunlight. This causes the coral to bleach—a visible sign of poor health.

Coral will bleach, or turn a white color, when something harms the tiny, microscopic algae called zooxanthellae (pronounced zoo-ZAN-thell-ay) that live within healthy coral (see “Mighty Microscopic” on page 18). These algae live in a symbiotic relationship with coral and give them food and their brilliant colors. In turn, coral provide zooxanthellae with protection and vital nutrients. If the zooxanthellae lose access to sunlight, they stop photosynthesizing and the coral loses its food and color. Coral are actually still alive for three to four weeks after they bleach. If their zooxanthellae return, the coral will survive; otherwise, they die.

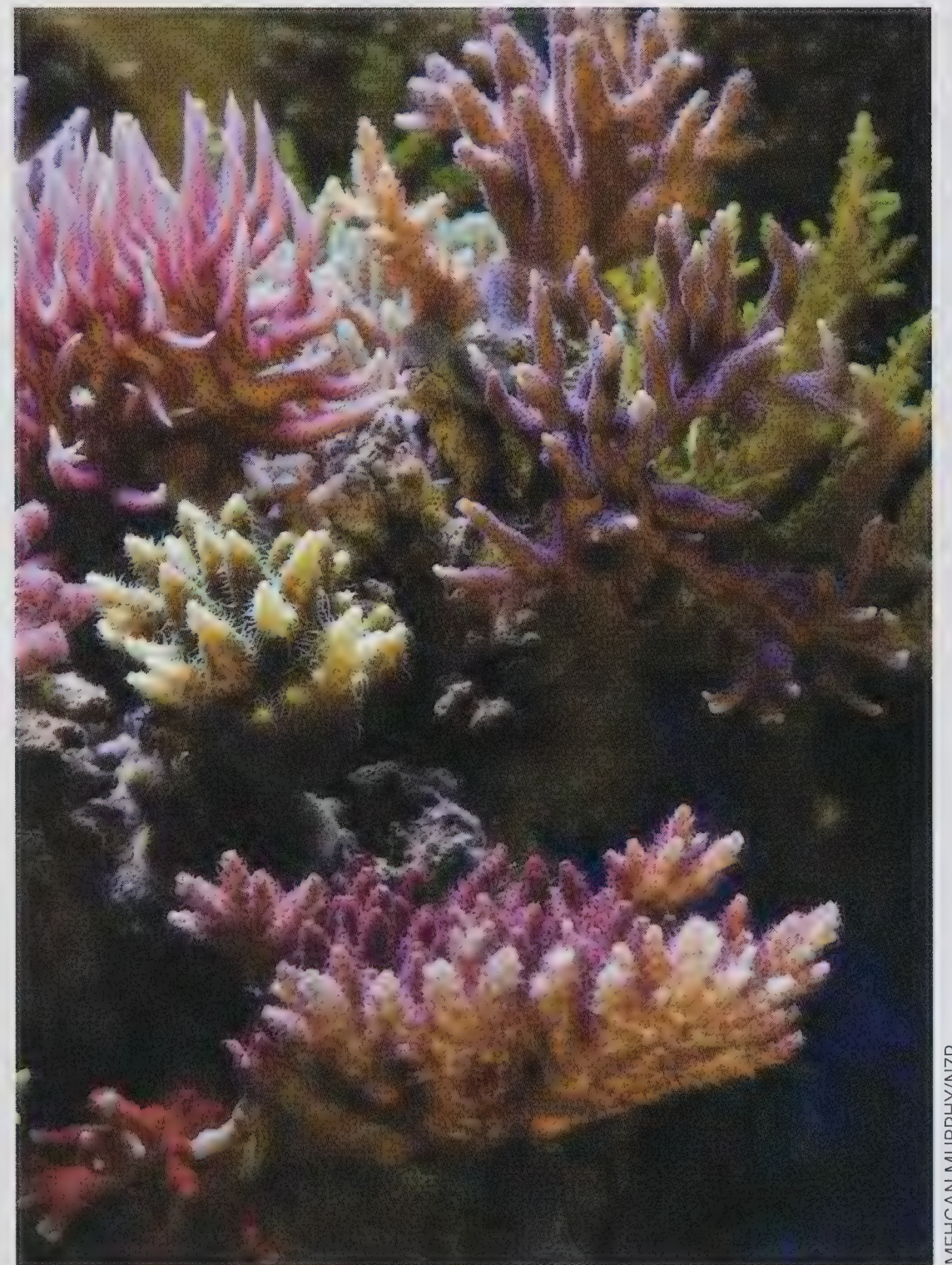
Coral also suffer when local homes dump pollution—chemicals like phosphates and



MIKE HENLEY/NZP



RAMON VILLAVEDE/SECORE, COLUMBUS ZOO + AQUARIUM



MEGHAN MURPHY/NZP

TOP LEFT: Ailing coral shows signs of bleaching, a visible sign of poor health.  
TOP RIGHT: Coral’s brilliant coloring is thanks to zooxanthellae, a type of algae.  
BOTTOM LEFT: Spawning coral release thousands of tiny gametes into the ocean.



nitrogen from detergent or fertilizers—in streams, which encourages the rapid growth of algae. An algae bloom can devastate, rather than help, an already struggling coral colony. Outcompeting coral for space and sunlight, the algae grows over the coral, which also leads to bleaching. Additionally, certain kinds of tiny algae can inhibit coral larvae from successfully settling on surfaces such as rock.

### Global Stressors

One of scientists' biggest concerns is global climate change—the Earth's oceans are warming. Because coral are already living at the upper limit of their temperature tolerance, even a slight increase in temperature can induce stress and cause them to bleach. "With global warming on the rise, ocean temperatures are increasing and adversely affecting coral reefs," says Hagedorn.

Another problem is acidification. When increased amounts of carbon dioxide in the atmosphere dissolve in seawater and cause a decrease in the ocean's pH, this inhibits the corals' ability to form a calcium carbonate skeleton. Other calcium-dependent sea life—such as clams, oysters, and scallops—are affected by this, too.

### Trouble in Paradise

Coral are disappearing around the world, but reefs in the Caribbean are showing the greatest distress. Elkhorn coral, the Caribbean's primary reef-builder, has declined by about 90 percent since the mid-'80s. Elkhorn and staghorn coral are the first two corals labeled threatened under the Endangered Species Act. That's why National Zoo scientists like Hagedorn and animal keepers like Henley traveled to Rincon with SECORE to help protect elkhorn coral.

Today, SECORE is made up of scientists and aquarists from around the globe, including the National Zoo. Along with studying coral breeding techniques, the group is training individuals from public aquariums and research institutions from



JAY REYNOLDS/MOODY GARDENS



RAMON VILLALVERDE/SECORE, COLUMBUS ZOO + AQUARIUM

**TOP RIGHT:** National Zoo invertebrate keeper Mike Henley nurtures elkhorn coral gametes through every step of development.  
**BOTTOM RIGHT:** Divers use nets to capture spawning coral at night.



## The Deep Freeze

**E**ach time SECORE scientists have traveled to Rincon, a team of cryobiologists led by Mary Hagedorn has accompanied the group to study and freeze elkhorn sperm. Hagedorn is pioneering the cryopreservation—the freezing, storing, and thawing—of coral sperm and is considered the world’s foremost authority on aquatic cryopreservation. She heads up the only team doing this kind of research.

While in Puerto Rico, Hagedorn and her team worked with the coral’s reproductive material for six days—testing, freezing, and gathering thousands of samples. Once her team froze the sperm, they shipped it in containers that were negative 196 degrees Celsius—the temperature of liquid nitrogen—to genetic banks at Omaha’s Henry Doorly Zoo in Nebraska, the National Animal Germplasm Repository in Fort Collins, Colorado, and the Centre for Genetic Resources in Wageningen, Netherlands. The National Zoo has cryopreservation tanks that store frozen sperm samples from animals such as giant pandas and cheetahs. Hagedorn hopes, with some expanded resources, to store coral samples at the Zoo in the next few years.

To guard against coral’s extinction, Hagedorn and her partners are creating the first genetic bank for coral reefs. This bank will hold frozen samples of coral sperm, embryos, stem cells, and DNA while habitats in the Caribbean are restored. Reproductive material could remain frozen but alive for hundreds of years in liquid nitrogen, and thawed samples could be used to seed shrinking coral populations.

The genetic bank initiative is part of the National Zoo’s Coral Conservation Program, a project designed and run by Hagedorn to prevent the extinction of coral and restore the species back to nature as needed.

Until last year, no functioning genetic bank for coral existed. “Thanks to the efforts of Hagedorn’s group, the technology is now available to continue developing a bank for the world’s most endangered coral species,” says invertebrate keeper Mike Henley. “They have achieved important milestones over the past four years in coral physiology and cryopreservation—and they’re the only group that has successfully preserved coral sperm and produced viable coral larvae with it.”

The Zoo’s Coral Conservation Program is based at the Hawaii Institute of Marine Biology (HIMB) on Coconut Island, Hawaii—the same place “Gilligan’s Island” was filmed. Hagedorn was assigned this station for a number of reasons. First, most coral around the world (including elkhorn coral) spawn only once a year, but Hawaiian coral spawn many times a year—allowing Hagedorn’s team to collect data quickly. Second, HIMB has sophisticated equipment for understanding the coral’s complex processes. And third, the area has a variety of coral that are healthy and easy to collect—many are just offshore.



National Zoo’s Mary Hagedorn (left) and Virginia Carter prepare coral for spawning on Coconut Island, Oahu.

When freezing the coral’s reproductive material, Hagedorn uses the same techniques that are used in human fertility clinics. “No one thought we could do this,” she says. “But we use the same microscopes, equipment, procedures, and freezing material as human labs.”

To successfully freeze a cell, Hagedorn will remove some of its cellular water and add an antifreeze-like substance. This helps to prevent damaging crystals from forming. If you’ve ever seen freezer burn on ice cream, the harmful crystals look the same. Throughout the process, Hagedorn has to be patient. If sperm cells are frozen too quickly, the water will not have time to exit and ice crystals will puncture the membrane and kill the cells. On the other hand, if they are frozen too slowly, the cells will be damaged by dehydration.

For the past five years, Hagedorn has perfected her cryopreservation technique by partnering with a number of prestigious organizations, including Omaha’s Henry Doorly Zoo; Chicago’s John G. Shedd Aquarium; Rotterdam Zoo; the University of Houston’s Department of Biology and Biochemistry; Columbus Zoo and Aquarium; the University of California’s Department of Anatomy, Physiology, and Cell Biology; and Louisiana State University’s Aquaculture Research Station.

So far, Hagedorn has had no problem freezing coral sperm. But eggs and embryos have been more of a challenge. Embryos are particularly important because they contain both male and female DNA. At present, Hagedorn has not been successful at freezing these materials because they fall apart when chilled. With her partners, she is experimenting with extremely low temperatures that will likely prevent the formation of damaging crystals.

How do living cells survive such extreme temperatures? “When we freeze cells their metabolism stops and they live in suspended animation,” says Hagedorn. Since the 1950s, scientists have been cryopreserving animal cells. Many animals’ reproductive material has been frozen, including such marine life such as oysters, fish, and clams. But Hagedorn is the first to work with coral.

— Dan Stone



around the world through workshops and on-site instruction.

“SECORE scientists first traveled to Puerto Rico in 2006 to collect coral gametes,” says Hagedorn. “From those efforts, the first elkhorn coral were raised in captivity and are now found in some zoos and aquariums.” Of all places in the Caribbean, Puerto Rico made the most sense for SECORE’s first efforts because it is a well-developed U.S. territory and has the infrastructure that the crew needed. Most importantly, it is home to one of the largest breeding populations of elkhorn coral.

### Spawning in Puerto Rico

In an incredible show of nature’s precision, elkhorn coral spawn for just one hour at night once a year. From 9 to 10 p.m., three or four days after the full moon in August, a spawning blizzard occurs just off the shore in Rincon. Elkhorn coral are hermaphrodites—meaning they carry the sex organs of both genders and release small bundles of eggs and sperm. For the past few years, SECORE divers including Henley and Hagedorn have

gathered these coral gametes as they disperse. With large butterfly nets in hand, they dive down to the spawning site and catch as many of the floating bundles as they can. Then they transfer the gametes to bottles and pass them up to kayaks that bring them to a mini-marine station on the beach. Once there, scientists place them in a large cooler, gently separate the egg-sperm bundles, and stir them for two hours to allow the eggs to fertilize. A fertilized coral egg will become a larva, which later can grow into coral polyps.

In collaboration with Henley and other aquarists, Hagedorn designed the mini-marine beach station to provide the best possible care for the coral larvae. Her set-up includes a number of small pools—kids’ wading pools filled with seawater from the reef. To keep the pools filled with fresh water, they use more than 75 feet of specially designed PVC piping that can bend around the coral and bring water from the ocean in and out of the pools. For the larvae to flourish, the water must stay fresh and at a constant temperature. The larvae also need to be in motion, so some of the

pools have specially designed features that automatically stir it. Because a few of the pools do not have this feature, they must be stirred manually, requiring the group to divide shifts during the day and night.

### At the National Zoo

From another Puerto Rico diving excursion in 2007, Hagedorn and Henley brought back 12,000 coral larvae to the National Zoo. Of these, 152 settled onto specially designed tiles and formed what are called polyps—millimeter-sized “baby” corals—that grow and multiply into the clusters that we recognize as coral. In the ocean, reefs that are hundreds of miles wide began with a single polyp. Out of the thousands of larvae from the 2007 trip, only one polyp survived for longer—it was on display at the Invertebrate Exhibit until it died in June.

Why didn’t more coral from the 2007 group survive? “Coral is very difficult to raise in captivity,” says Hagedorn. “For the first three months, it is very sensitive to change—especially to variations in light, pH, and oxygen levels. Overall, however, algae and water quality are the biggest issues.”



MIKE HENLEY/NZP



# Caring for **Coral**

Aquarium enthusiasts know that coral can be easily grown in captivity from broken fragments of parent colonies. But those new coral are clones with the same genetic makeup as the parent coral. They are not genetically diverse, and are therefore less likely to survive environmental changes.

In 2008, SECORE scientists collected and harvested close to one million larvae in Rincon. More than 400,000 were brought back to zoos and aquariums, and now around 3,000 larval recruits are living and thriving at these organizations.

From the 2008 trip, Hagedorn and Henley brought back 36,000 coral larvae to the Zoo. Although 3,500 of these larvae settled, none remain. Other zoos trying to raise the elkhorn coral recruits seem to be experiencing the same problem. Some were able to raise between one to five coral larvae, but not many more than that. One zoo, however, has been hugely successful rearing the larvae. Omaha's Henry Doorly Zoo is



MEGHAN MURPHY/NZP


Elkhorn coral polyps form clusters.

rearing 1,000 coral from the 2007 trip and another 1,000 from 2008. The National Zoo is closely studying Omaha's techniques to try to reproduce similar successes.

"I really believe in this project," says Henley. "We need to keep collecting more coral gametes and bringing more larvae back. In case the unthinkable happens and coral go extinct, these zoo populations could be all that's left."

## Back in the Wild

Should coral disappear, the future-thinking programs of SECORE and the National Zoo's Coral Conservation Program could help reintroduce the animals back into the wild. High-tech solutions such as frozen banks (see "The Deep Freeze," page 16) may provide a major new strategy for zoos and aquariums, enabling them to maintain more live coral in each location.

"We'd love to help reintroduce coral back into the wild someday if the need arises," says Hagedorn. "But there is still so much we don't know, like when we should return young coral to their natural habitat. Should they go back when they're two months old or two years? Much more research needs to happen before we reach that point." 

—DAN STONE *is the contributing editor of Smithsonian Zoogoer.*

## MIGHTY **microscopic**

In the wee hours of the morning, just off the shores of Puerto Rico, invertebrate keeper Mike Henley scours the seafloor for an animal too small to be seen with the naked eye. A broken, hand-sized branch of elkhorn coral (*Acropora palmata*) materializes in the darkness, dangling over the edge of a cavern. He delicately scoops it up and returns to shore with his find. Hiding inside is a tiny creature that is critical to coral conservation: a golden-brown alga named zooxanthella.

Hours earlier, Henley had spent part of the evening capturing elkhorn coral gametes. But parent corals send their babies off without zooxanthellae—an essential part of their care package. "Zooxanthellae provide each coral with 90 percent of its food," explains Henley. "Without them, coral would never survive."

Zooxanthella mimics a plant, but it is actually a single-celled animal. When this alga reaches maturity, it sprouts two propulsion limbs, called flagella, and searches for a place to live. It makes itself at home on a coral, jellyfish, or anemone and settles in the stomach or skin of its host. Zooxanthella and its cousin, plankton, are among the most abundant—and most consumed—animals in the ocean.

Corals eat zooxanthellae but don't digest them. Instead, they snap up the one-celled organisms' byproducts, turning them into calcium carbonate (for its hard skeleton), proteins, carbohydrates, and even fat. In return, zooxanthellae receive carbon dioxide—an essential ingredient for photosynthesis—and protection from predators. It's a symbiotic relationship—both species win.

Henley has a specific process for collecting zooxanthellae. At a beach lab, he uses a water pick to blast the coral branch with seawater. The coral strips away like a banana peel, shedding layers and even chunks of flesh. When little but bare bones remains, he places the coral in a spinning, water-filled tub called a centrifuge, which breaks up the coral. As the skeleton sinks to the bottom, zooxanthellae cling together and rise to the surface, where Henley gathers them in vials.

Zooxanthellae contain photosynthetic pigments that give corals their vibrant colors. Unfortunately, the type of zooxanthellae that elkhorn consumes easily succumb to stress. Exposure to air during low tides, too much or too little salt in the water, too much sun, fertilizer runoff, and even the clarity of the surf can disturb the sensitive animals.

A week after capturing coral gametes in Puerto Rico, Henley returns to the Invertebrate Exhibit's lab at the National Zoo and places his catch in a settling tank. After a week of growth, the gametes have morphed into wormlike larvae that crawl along the tiles. Those that settle anchor themselves and transform again, this time into the familiar polyp shape. Only then are zooxanthellae added. As they swim about, the tentacles of stealthy polyps snatch them out of the water.

"Under a microscope, you can see these little green zooxanthellae moving around in the polyp's stomach," Henley marvels. "It's really amazing!"

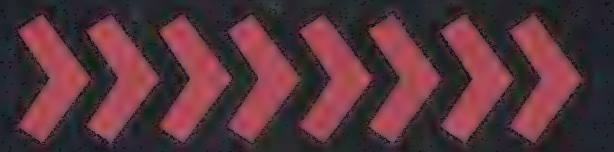
—Jennifer Zoon



Dentist Barron Hall extracts the tooth of a spectacled bear.

# Helping Hands

Medical professionals bring their expertise to the National Zoo to help care for the animals







MEHIGAN MURPHY/NZP



DEPARTMENT OF ANIMAL HEALTH/NZP



COURTNEY JANNEY/NZP

CLOCKWISE FROM TOP: Veterinary resident Margarita Woc-Colburn monitoring anesthesia for a zebra; radiologist Cynthia Sloan performs an abdominal ultrasound on an armadillo; pediatric surgeon Kurt Newman and the Zoo's chief vet Suzan Murray help a golden lion tamarin.



**WHAT STARTED AS A ROUTINE CHECKUP ON A** ten-year-old ring-tailed lemur quickly turned into a medical mystery when an X-ray revealed fluid in the animal's lungs. Why was an otherwise healthy primate showing classic signs of congestive heart failure? To help investigate, Smithsonian's National Zoo veterinarians called in ultrasound specialist Cynthia Sloan and cardiologist Steven Rosenthal from veterinary clinics in the Washington area.

They discovered an important clue: "buzzing," or vibration, in the animal's groin, which signals an abnormal connection between an artery and a vein that causes the heart to work overtime to pump blood to the tissues.

To repair the problem, the vets turned to doctors who have vast experience operating on small bodies with similar anatomy: Kurt Newman, chief of surgery at Children's National Medical Center, and his colleague, pediatric vascular surgeon Philip Guzzetta. Their patient recovered and is now enjoying life on the Zoo's Lemur Island.

This is just one example of how the Zoo's veterinarians join forces with local physicians and veterinary specialists to provide the best possible medical care for the Zoo's residents. National Zoo chief veterinarian Suzan Murray has a working relationship with at least 15 outside specialists—surgeons, cardiologists, dentists, dermatologists, anesthesiologists, gastroenterologists, neurologists, oncologists, immunologists, urologists, and ophthalmologists—to whom she can turn for assistance. All of them volunteer their time to help the Zoo.

"As specialists in zoological medicine, we can perform most procedures on our own," says Murray. "However, if we have an animal that is extremely endangered, or if there is another specialist with an appropriate skill set that we don't have, that's when we reach out to our consultants."

### Calling on the Community

When a Grevy's zebra showed signs of abdominal distress, Murray called Jennifer Brown, an equine specialist at a satellite hospital of the Virginia Tech veterinary school in Leesburg, Virginia. Brown decided she needed to operate in order to fix a twisted intestine, which can be fatal if not treated promptly. "It's not common in zebras, but in horses it's our most common emergency surgery," says Brown. "Once they covered up the stripes, it was just like operating on a horse."

Brown also performed surgery on a critically endangered dama gazelle to repair a tear in its vaginal wall, caused by a stillborn calf that was incorrectly positioned in the birth canal. Because the gazelle's reproductive tract is very similar to that of horses and cows, Brown was a natural choice. Her skilled hand was essential to help ensure that the endangered gazelle will be able to conceive and deliver a healthy calf in the future.

Sometimes an animal's behavior dictates a certain approach. Such was the case when Zoo vets decided that some of the Zoo's female orangutans should undergo tubal ligations in order to prevent pregnancies. These orangutans are Bornean-Sumatran hybrids, and the North American Orangutan Species Survival Plan designates that hybrids be placed on permanent contraception. Murray explains that it was important to go with a procedure that would avoid large incisions, because orangutans are very dexterous with their fingers and good at removing sutures. So she called in a veterinary laparoscopic surgeon, Clarence Rawlings, who performed the procedure via a thin tube inserted into two small incisions. He even added a few decoy sutures to reduce the chances that the apes would pick out the real ones. For good measure, keepers painted the ladies' fingernails to give them something else to pick at.

One of the more frequent visitors to the zoo is veterinary dentist Barron Hall, who repairs and, when necessary, extracts teeth from everything from tiny golden lion tamarins to larger mammals such as tigers and gorillas. "A lot of it is endodontic [root canal] work, because we try to save the teeth if we can," Hall says. Some animals, like elderly lioness Lusaka and female sloth bear Hana, have had as many as four root canals. Each species has its own challenges, Hall notes. "Apes have dentition very similar to ours, but with some of the bears and smaller animals, we don't necessarily have dental charts and just have to wait until we get in there. Working on hoofed

MEGHAN MURPHY/NZP



**Animal keepers applied nail polish to a female orangutan's fingernails to distract her from picking at sutures.**

stock can be extremely difficult, especially in the back of the mouth, because they can't open their mouths very far. Often we have to go through the outside to get to the roots of the teeth."

The chance to help a variety of animals has led veterinary ophthalmologist Seth Koch to volunteer his time at the Zoo for 30 years. He has cared for everything from Sumatran tigers to giant pandas to, most recently, a milksnake. He once operated on a 50-plus-year-old crane with cataracts, enabling the bird to see again.

Another of Murray's valued consultants is surgeon Kurt Newman, who refers her to a variety of specialists in the area; often, they are his colleagues at Children's Hospital. "Pediatric doctors are used to having patients who can't tell them what is going on, so that may give us a leg up in some of these cases," Newman says. "With children we have to rely on the family, and at the Zoo we listen to keepers and the observations of staff."



Newman remembers his surprise when Murray first called to seek his help with a tree kangaroo that had an infection of the face. “She was asking me about the location of the facial nerve, because they didn’t want to get into trouble when they operated,” he recalls. “I was thinking, ‘Oh my, how am I going to act smart here?’ Finding the facial nerve in a little baby is extremely difficult, and I wasn’t even sure what a tree kangaroo looks like.” Nevertheless, Newman offered to visit the Zoo and do what he could to help. “The night before,” he says, “I was talking to my son, who was then about eight, about this tree kangaroo, and he said, ‘Why don’t you just Google it?’ So we went online and found out that it lives in the forests of New Guinea and has a long face. So when I walked in there the next day, I was able to say, ‘Well, it has a long snout, so that nerve should be somewhere about here.’”

### Picturing a Diagnosis

Just as in human medicine, sophisticated imaging technology has greatly improved the diagnosis and treatment of animal patients. National Zoo vets make use of portable digital imaging equipment donated by Fujifilm that allows them to

take X-ray images that they can manipulate digitally afterwards—which is extremely helpful when dealing with large animals where you can’t always move them around to shoot multiple images.

Zoo vets also use ultrasound to monitor pregnancies and for routine diagnoses. But for more complicated procedures—such as investigating the lemur’s cardiovascular problem or performing an ultrasound-guided needle biopsy of a cheetah’s liver or an abdominal mass in an armadillo—they call on Cynthia Sloan, a radiologist at Southpaws Veterinary Clinic in Fairfax, Virginia.

When more extensive imaging is warranted, animals are sometimes transported to facilities outside the Zoo. At Southpaws, for example, Sloan has performed CT scans on a tortoise that could not move its limbs and a barium X-ray on a crane that could not swallow. Animals with suspected neurological problems—a golden lion tamarin with an abnormal gait, and a cheetah suspected of having pituitary gland tumors—have traveled to Iams Pet Imaging Center in Vienna, Virginia, which specializes in MRIs. All such scans are provided free of charge for the Zoo’s animals.

**For the specialists, treating Zoo animals keeps them on their toes.**

On several occasions, doctors have gone to great lengths to take specialized equipment directly to the Zoo’s patients. When a kidney stone blocked the ureter in an Asian small-clawed otter, Murray determined that surgery was not an option, because in otters a ureter that has been cut will constrict and close when it heals. She consulted Jason Engel, a urologist at George Washington University Hospital, who recommended shock wave lithotripsy. This procedure, which is also used with people, bombards kidney stones with sound waves and breaks them into tiny particles that can be passed in the urine.

“I actually asked GW Hospital if I could bring the animal in there, but that wasn’t kosher,” Engel says. “So I arranged to truck-in a mobile lithotripter owned by my group of doctors and asked a technician to volunteer to help. We set it up at the Zoo hospital, and the little animal was all ready, but



MARGARITA WOC-COLBURN/NZP



when we took an X-ray to get the stone in the crosshairs of the machine, it turned out the otter had passed the stone.” Despite all the effort for naught, “afterward, everybody said they’d come back down in a heartbeat if we needed them,” Murray recalls.

### Handling ‘Wild’ Patients

The outside specialists say that the greatest challenge of working with Zoo animals is that the patients must be anesthetized for any hands-on procedure, even diagnostic evaluations that would be routine on domestic animals. Nor can the doctors do much to relieve the animals’ stress. “You can’t pick them up and scratch them behind the ears or sit with them in recovery, petting them and talking to them as I do with my other patients,” says Julie Smith, medical director and chief of anesthesia at Iams Imaging.

“We always question the influence of stress and sedatives on our diagnostic data,” says veterinary cardiologist Steven Rosenthal of Chesapeake Veterinary Cardiology Associates, who has helped care for the Zoo’s animals for the past 12 years. “What in fact is normal is not necessarily established for these species. Also, within a spe-

cies like dogs, there are different normals for different breeds, and we would expect the same is true in other species.” Specialists often have to rely on comparative medicine, he adds. “I know what’s normal in companion animals and what’s normal in people, so I have to make some leaps in what I perceive as normal in zoo animals.”

During any procedure involving zoo animals, efficiency is critical because anesthesia can be especially stressful. Zoo animals require constant monitoring to make sure they are sedated enough for safety, but not so deeply that their cardiovascular and nervous systems are dangerously depressed. With large animals, such as elephants, giraffes, or zebras, the sheer weight of lying on their side can compress muscles and nerves and cause damage. To minimize the risk of complications, vets try to limit the animals’ time under anesthesia to less than two hours.

The specialists all agree that treating Zoo animals keeps them on their toes, is a welcome change from their day-to-day routine, and is one of the most satisfying things they do. They treasure photos Murray sends them of their patients, signed by the Zoo’s veterinary staff. “They treat me like a rock star,” says radiologist Cynthia

Sloan. “They don’t understand how much I love going out there. Their animal care is amazing, and the staff is so grateful, so kind and appreciative.”

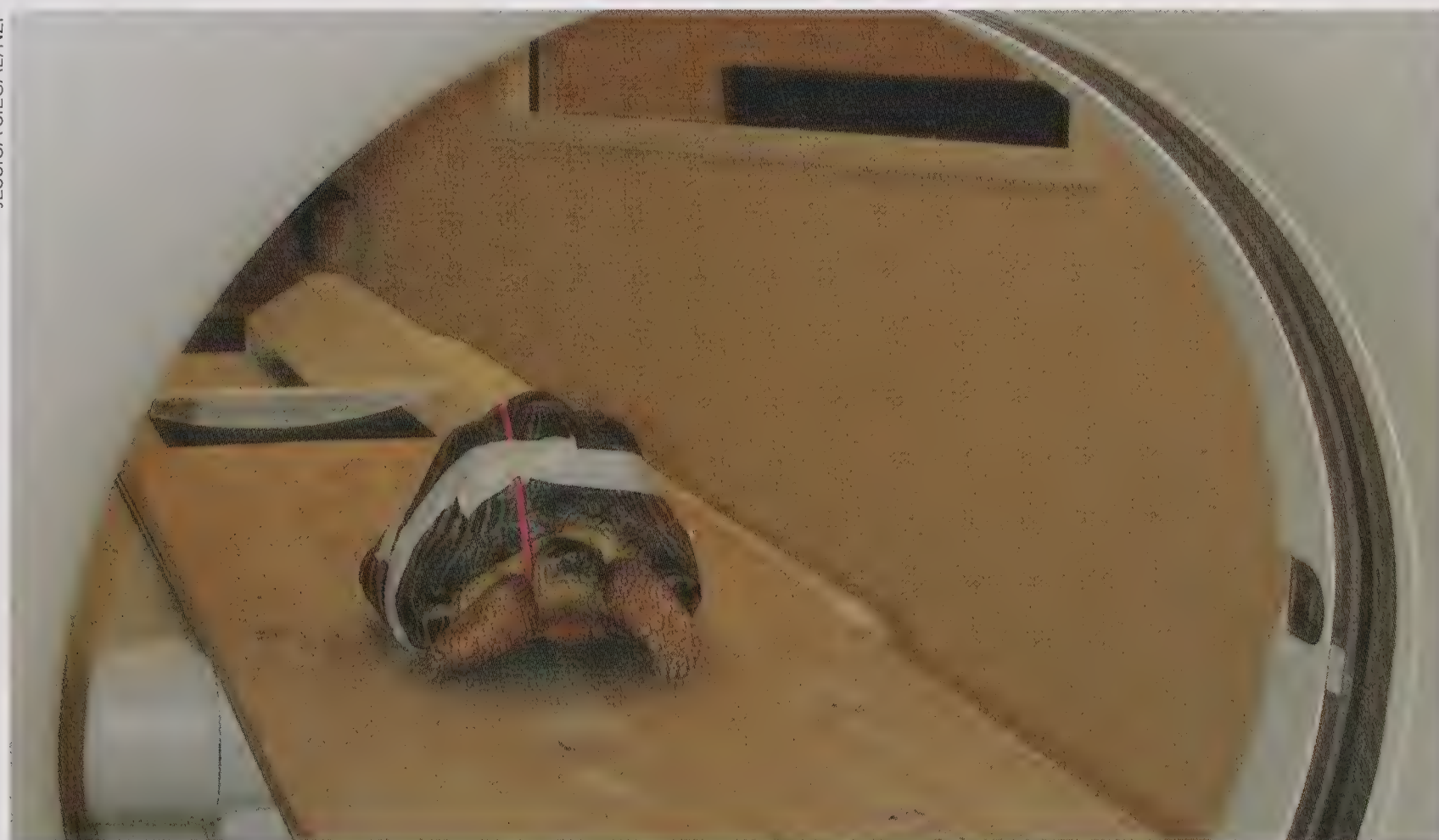
Some, like anesthesiologist Julie Smith and dentist Barron Hall, had previous experience working with zoos and are delighted with the opportunity to continue it here. Hall even chose to buy his current veterinary dentistry practice in Virginia because the previous owner had a long working relationship with the National Zoo.

The Zoo experience “has kept me thinking and inspired me to delve into areas that I otherwise wouldn’t have,” says cardiologist Rosenthal, who tracks the heart health of all the Zoo’s great apes in an effort to learn why captive male gorillas are especially prone to heart disease. “I think that has helped me as a clinician for the patients I routinely see.”

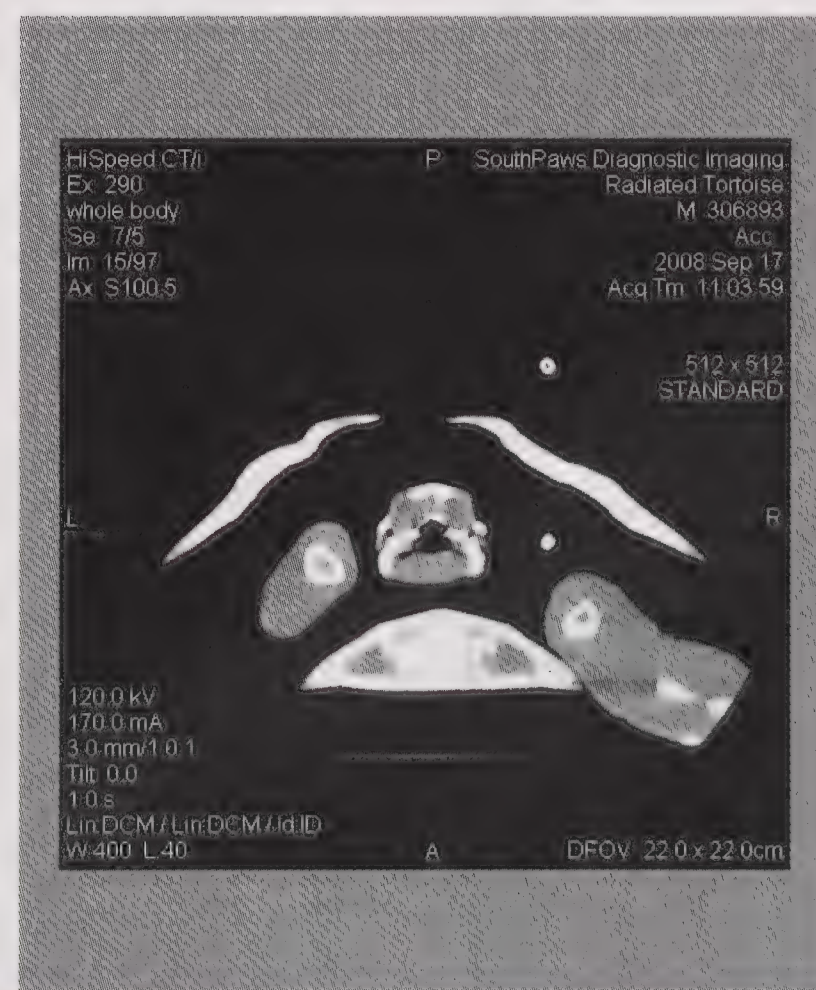
Besides, adds Kurt Newman, “It all makes for very interesting conversations with my kids and at cocktail parties.”

—PHYLLIS MCINTOSH *is a freelance writer who often covers medical topics and has published in numerous national magazines. She is also a volunteer interpreter at the National Zoo.*

JESSICA SIEGAL/NZP

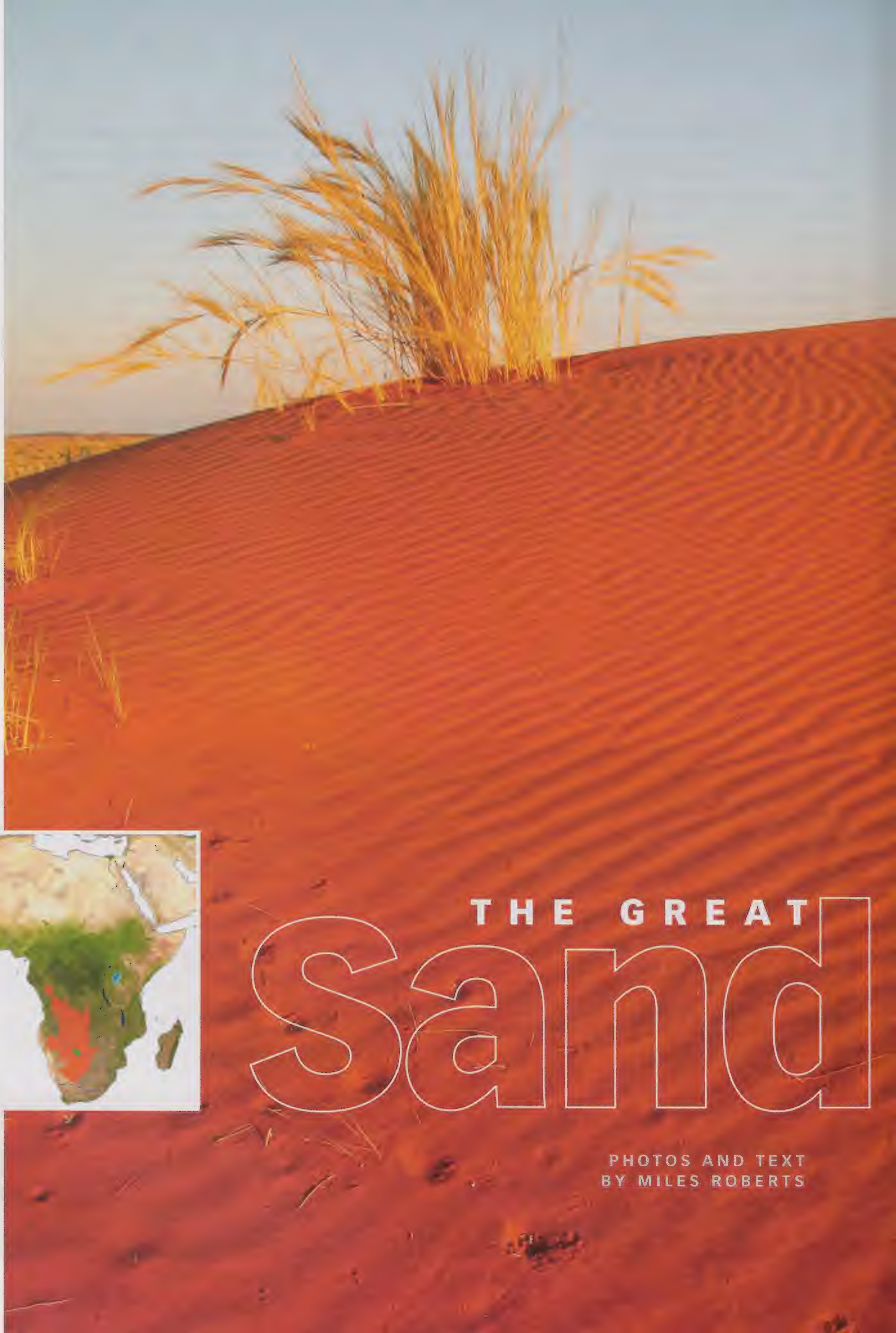


LEFT: Veterinary ophthalmologist Seth Koch and Zoo vet Nancy Boedeker examine a milk snake’s eye. ABOVE AND RIGHT: A tortoise gets a CT scan; the image shows the results.



**ANIMALS ONLY!** — There is a persistent rumor that the Smithsonian’s National Zoo’s vet hospital sometimes makes its facilities available for medical procedures on special-needs human patients, such as the very obese. “Absolutely untrue!” declares chief veterinarian Suzan Murray, who fields an average of one such request per month. **“We are not licensed for human medicine and never treat people.”**

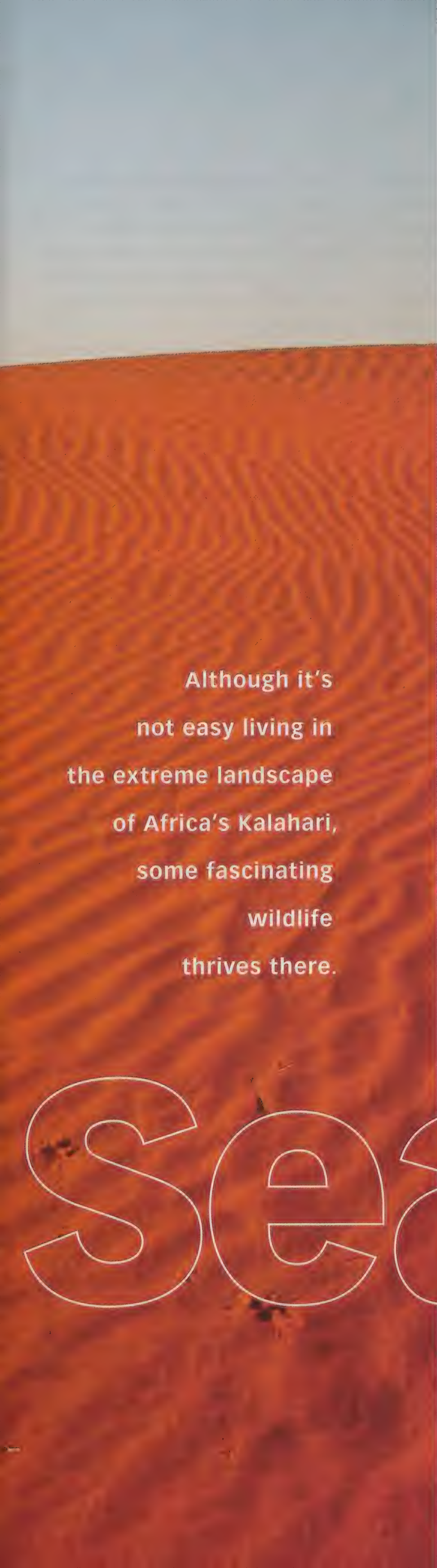




# THE GREAT Sand

PHOTOS AND TEXT  
BY MILES ROBERTS





Although it's  
not easy living in  
the extreme landscape  
of Africa's Kalahari,  
some fascinating  
wildlife  
thrives there.

# Sea

## At almost a million square miles, the Kalahari

sprawls over the heartland of southern Africa like a great sandy sea. It is a vast, arid plateau ringed by ancient mountains and blanketed by the Kalahari sand sheet, probably the largest continuous mass of sand in the world.

From the air, the Kalahari presents the quintessential desert landscape. Ochre-red dunes ripple endlessly in neat parallel lines. Dry, fossilized riverbeds snake among them, vestiges of a time when surface water flowed freely. And countless pans—shallow, circular depressions a few meters to several kilometers in diameter—dot the landscape, revealing where life-giving water once was and will be again after rain.

On the ground, it is all about sand—every conceivable manifestation of the stuff. Nine-tenths of the Kalahari's sand is fine-grained, gritty white, pink, or red quartz. The rest is a kaleidoscopic mix of zircon, garnet, feldspar, and tourmaline. It covers ancient bedrock in a deep, structureless infertile sheet. This layer is topped by a thin veneer of organic matter that is distributed in tiny islands of fertility known as “biological soil crusts.” Drought-resistant microorganisms reside here, binding soil particles together, fixing atmospheric carbon dioxide, and adding significant nutrients to the soil.

The Kalahari environment is famously harsh. Summers are brutally hot, winters bone-chillingly cold. Incessant winds sandblast and disfigure the landscape, and the vegetation is eternally coated with dust and grit. While there is an annual “wet season,” months, sometimes years, pass in some places with little or no rain. With the exceptions of the Orange River on its extreme southern edge and the Kwando and Okavango rivers in its center, the Kalahari has almost no year-round surface water. Yet it is alive with plants and animals remarkably adapted to surviving in this extreme environment.

In late spring and summer, after months of winter drought, clouds gather in the vast Kalahari sky and rain falls on the parched landscape. The rains awaken dormant plants and their pollinators and stimulate great movements of animals seeking water and food. Lions, hyenas, jackals,

and cheetahs shadow herds of hoofed mammals. Water birds—flamingos, pelicans, ducks, and geese—flock to the pans in surprising numbers to feed and reproduce. But the water's presence is ephemeral. In the pans, it remains only a few days or weeks before evaporating. Elsewhere it is quickly used by vegetation or absorbed by the sandy soils.

Though sometimes called a desert, the Kalahari is almost entirely covered by a mosaic of grass and woodland. But for long stretches of the year, the only water available for plants and animals lies underground, mostly sealed away in deep aquifers. Kalahari plants are supremely adapted to these arid conditions and are adept at finding, sequestering, and conserving scarce water. Many, like grasses and vleililies, sit out long dry periods on or below the soil surface in the form of dormant seeds, bulbs, and corms that develop rapidly when exposed to water. Many shrubs, trees, and creepers resist dehydration with physical adaptations: small, tough, waxy leaves; thick bark; a small size; spongy, water-storing



## THE GREAT Sand Sea

wood; and sprawling, water-seeking root systems. A few, like the tsamma melon and gemsbok cucumber, store water in prominent fruits and are an important source of moisture for many animals.

The Kalahari's animals are as adept as its plants at conserving water and contending with extreme heat and cold. Ectotherms, the so-called "cold-blooded" animals (such as reptiles, amphibians, and arthropods) whose body temperatures vary with that of the surrounding environment, have a fairly simple strategy. To warm up, they are active during the day and hang out in warmer, sunnier spots as needed. To cool down, they seek shade, burrows, or crevices

away from the sun and heat. Because they are unable to adjust their body temperatures, many ectotherms find themselves at the mercy of cooler temperatures at night and retreat to safe hiding places.

Some ectotherms take matters into their own hands and construct climate-controlled habitats that would make environmental engineers proud. The most prominent of these are desert termites, whose homes are massive constructions made of bits of soil "glued" together with pasty spit. Each termite species has a distinct architectural style: some construct amorphous subterranean bunkers, while others create great obelisks and fluted spires that may rise three

or more meters into the air. The interiors of these structures are lined with honey-combed passageways that serve as safe transit routes for their soft-bodied inhabitants, and as a ventilation system that helps maintain a constant interior temperature and humidity.

The termites' communal industriousness inadvertently benefits other wildlife as well. Many Kalahari animals—aardvarks, aardwolves, dwarf mongooses, some lizards, birds, and even ants—are specialized termite predators. Some catch their prey by stealthily entering mounds, others sit and wait outside for prey to emerge, or simply bulldoze their way through the thick walls.



MEGHAN MURPHY/NZP

**ABOVE:** Pans—small, closed basins with hard, alkaline floors—are common in low-lying areas. They capture and temporarily store rainwater, becoming nutritious environments for plants and animals. Among those that benefit from pans are brine shrimp, fairy shrimp, and algae that persist in a dormant state during drought, emerge almost immediately upon contact with water, and multiply in vast numbers as long as water persists. Suddenly rich with blooms of tiny organisms, pans attract a rapid succession of birds that breed, raise young, and eventually move on. Among these are flamingos, which gain their pink coloration from the shrimp and algae they eat.

**RIGHT:** Cooperation is a strategy that pays off big time in extreme conditions like the Kalahari's. Meerkats inhabit the most arid environments of any mongoose, and, not coincidentally, are legendary practitioners of social cooperation. They typically live in bands of four to ten individuals that forage together and vigorously defend their territory against other bands. They also sleep communally in burrow systems that are often shared with ground squirrels. Meerkats are cooperative breeders and while usually only a single dominant pair in each band reproduces, all adult group members help with the guarding and feeding of young. In the Kalahari, meerkat survival and breeding rates are closely linked to rainfall. In very dry years, overall mortality increases and reproduction may cease altogether, leading to a marked decline in the number and size of bands.





Among the larger ectotherms, two groups stand out. Most Kalahari snakes are what herpetologists call “hot”—they are highly venomous. One notable is the puff adder, a common, highly venomous, but sluggish serpent whose hunting strategy is to sit motionless in its camouflaged skin and wait for unsuspecting prey to amble within striking range. This habit is certainly an energy-saver, but a particularly dangerous one for non-prey—especially bare-legged tourists in flip-flops, who occasionally venture too close to a hiding puff adder. But the reigning monarch of Kalahari snakes is the cape cobra—a large, startlingly yellow snake with cold,

jet-black eyes, lightening speed, and a decidedly cranky disposition. And, if that’s not scary enough, one of its favorite meals is the puff adder.

Scorpions, which are ubiquitous in the Kalahari, come mainly in two forms: large and black with slender tails and huge pinchers used for capturing and crushing small prey, or small and tan ones with small pinchers and bulbous tails loaded with deadly venom. Both types are everywhere—on the ground, in houses, in shoes, in shower drains—but surprisingly the small, tan scorpions are more dangerous.

The larger Kalahari animals—mammals and birds in particular—are mostly



## Handle With CARE

**U**ntil recently, the Kalahari has been largely immune to the changes brought by technology, farming, and pastoralism. But this is changing, to the detriment of wildlife and indigenous people. Vast areas have been opened to domestic animals for grazing. These areas, once considered unfit for livestock have been made more hospitable by predator control, massive “veterinary fences” that separate potentially disease-bearing wild animals from domestics, and the drilling of boreholes to siphon water from deep aquifers to bring water to previously dry lands. The human population is growing around the Kalahari’s edges, and the new trans-Kalahari highway will be a conduit for more human settlers. Mining concessions—for diamonds, gold, and minerals—are opening up to foreign enterprises, some of which seem to have little respect for the fragile Kalahari landscape.

In order for the ancient Kalahari to survive modern challenges, its biological resources must have economic value. Fortunately, a new conservation paradigm is emerging, one in which local communities share directly in the management and economic benefits of conservation and development, whether derived from ecotourism, farming, wildlife hunting, or resource extraction. Some southern African countries—South Africa, Botswana, and Namibia—are world leaders in developing these private and community-based economic conservation models, and many are generating win-win-win results for animals, people, and the environment.



Lions face extraordinary challenges in the harsh Kalahari environment. They must roam great distances in search of prey, but must also remain close to water. In the dry season, lions frequent waterholes where they can wait and ambush thirsty prey, from porcupines to giraffes. In wetter summer months, lions often travel more than 12 miles per day in open habitat in search of dispersed prey. It is under these difficult foraging conditions, which can last eight months or more each year, that hunting in coordinated, cooperative groups becomes particularly critical to survival. But even under the best of conditions, the mortality of Kalahari lions is among the highest in Africa.



## THE GREAT Sand Sea

endotherms, or animals that control their own body temperature more or less independently of the environment. Many are familiar to visitors of the Smithsonian's National Zoo and other zoos: lions, leopards, cheetahs, wild dogs, spotted hyenas, zebras, giraffes, ostriches, and meerkats. Others may be less well known, but are icons of the Kalahari landscape: gemsbok, springbok, wildebeest, kori bustards, pale-chanting goshawks, ground squirrels, and the ever-present jackals. Nighttime in the Kalahari brings out armadillos, armadillos, bat-eared foxes, and springhaas.

The endotherms have a wide range of physiological and behavioral adaptations that enable them to live and even thrive in this hostile, near waterless environment. A gemsbok—a large antelope—can live for months without drinking and has a remarkable blood-vessel, heat-exchange system in its sinuses that helps it get rid of

heat. Bat-eared foxes have giant ears for detecting subterranean animal prey like termites and scorpions. Ground squirrels shade themselves against the hot sun with their huge, umbrella-like tails. Antelope (springbok, wildebeest, hartebeest, dik-dik, eland, kudu, and others) forage at night, dawn, and dusk, and take refuge in the shade of trees and shrubs during the heat of the day.

Meerkats live in cooperative groups that forage collectively during the day for protection and huddle together in burrows at night for warmth. Sand grouse carry water back to their nestlings in spongy spaces between feather barbules. Rodents of all sizes (striped mice, springhaas, porcupines, and others) spend hot days in insulated burrows or arboreal nests and forage at night when it's cool. Social weaver birds build massive communal nests, some weighing over a ton, which provide protec-

tion from predators and insulation against temperature extremes. Many birds simply migrate to more suitable climates and return when rain brings a flush of vegetation and fresh food.

The severe Kalahari environment has been the crucible of evolution for a remarkable group of animals and plants that are superbly adapted to life within the thinnest of biological margins. But the Kalahari is a fragile environment, and we must wonder how it will respond to change, already evident in fence lines, pipelines, roads, and tracks that crisscross the landscape. How will the lives of its creatures, already in a delicate balance, be affected? Only the passing of the sands of time will tell. ▀

—MILES ROBERTS is a wildlife biologist with the National Zoo's Center for Conservation and Sustainability. His interest in ancient deserts began when he was growing up in Australia.





## DID YOU KNOW?

## Curiosity Weighed the Octopus

**N**othing captures the attention of Augusta—the Invertebrate Exhibit's giant Pacific octopus (*Enteroctopus dofleini*)—quite like the sight of food. So when it comes time for her monthly weigh-in, keepers dance a shrimp along the top of her enclosure. When Augusta sees her favorite meal, she grabs it and tastes it with sensors located in the suckers of her arms. After wrestling her prey from the feeding stick, she swims over to investigate a laundry basket keepers have placed on the bottom of her cage. Octopuses are naturally curious, so Augusta willingly climbs in the basket to explore. Once all eight legs are inside, keepers lift the basket out of the water and hook it to a scale for her check-up.

This growing girl weighs nearly six pounds—a good size for a young, captive octopus. But wild giant Pacific octopuses, which live in the waters between California and Japan, can weigh almost 100 pounds!

—JENNIFER ZOON



### SUPERLATIVE Most Expensive Taste

**T**he Zoo's American flamingo (*Phoenicopterus ruber*) flock looks pretty in pink, but fashionable color comes at a price. Flamingos don't eat that much, but at two dollars per pound, the dry pellets they eat are more expensive than the hay, fruit, and vegetable diets of the Zoo's other animals. That's because the pellets are full of vitamins and made with brine shrimp meal. They also contain a pigment that turns the flamingos' feathers, legs, and faces a vibrant pink—just like the carotenoid pigments found in brine shrimp. With 60 flamingos living at the Bird House, that adds up to between 70 and 80 pounds of seafood pellets, or \$160, every day!

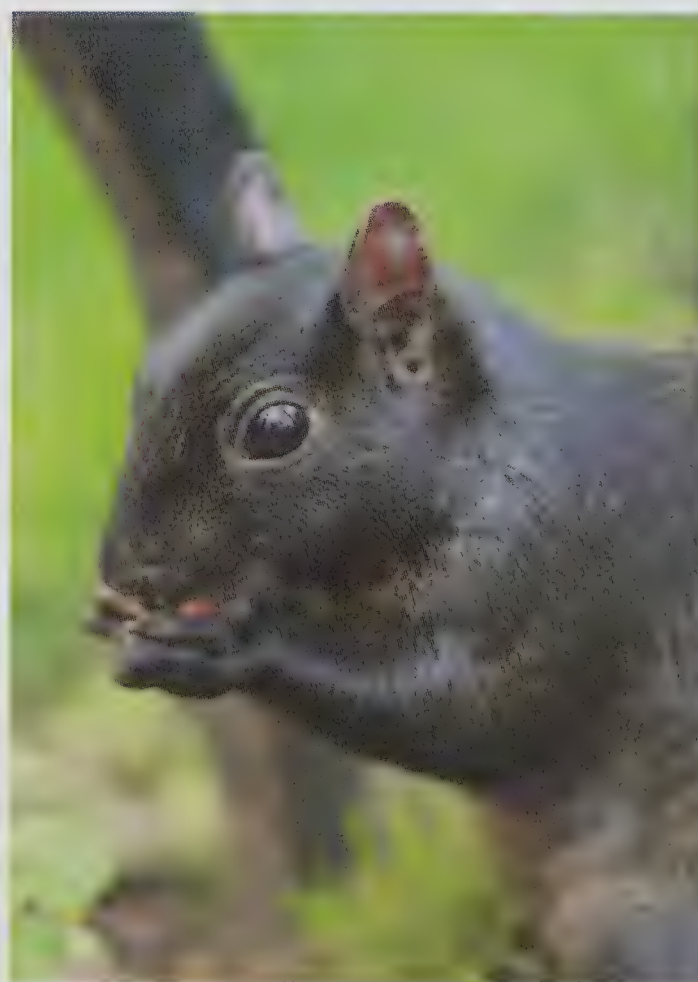
—Jennifer Zoon

### LOCAL LORE You've probably seen gray squirrels

darting through the National Zoo, but has a black squirrel ever crossed your path? These inky rodents were originally shipped to Washington, D.C., from Ontario, Canada—by the Zoo. A total of 18 were released on Zoo grounds in 1902 and 1906 for visitors to admire, and they have since spread throughout the city and beyond.

"Black" squirrels and gray squirrels are the same species, with slightly different DNA (just as blondes and brunettes are both humans). The number of dark-furred squirrels seems to be growing in certain parts of Washington and surrounding areas, but shrinking in others, says Richard Thorington, curator of mammals for the National Museum of Natural History. If black fur is responsible, science has yet to prove it. Darker fur may help squirrels survive winter by absorbing warm sunlight better than gray fur, but a stark black coat might attract more predators. Black squirrels certainly get noticed by Zoo visitors, but Thorington says, "You should consider them just a normal gray squirrel with different coloring."

—HAYLEY RUTGER



### Can you identify this interesting body part? »

Take a guess, then check your answer at <http://nationalzoo.si.edu/goto/whereinthezoo> to find the answer and learn more.!





This curly-topped bird  
is not lost—  
it's critically endangered.

Once common,  
the blue-billed curassow  
(*Crax alberti*) now  
numbers fewer than  
1,200 in the wild.

It's even more rare  
than the giant panda.

That's why the  
Smithsonian's National  
Zoo and others  
want to find  
ways to keep it  
from disappearing.

BY PAMELA  
BUCKLINGER



JESSIE COHEN/NZP



**Description »** This bird is the size of a turkey but looks like a chicken with a wig. It has black feathers with white accents, a bright blue bill, and serious tail feathers. Keepers must use caution when approaching it. It is curious, can be aggressive, and displays explosive bursts of flight. Favorite snacks include fruit, worms, plants, and on rare occasions, carrion (dead animals).

**Last Seen or Last Heard »** Sometimes researchers hear curassows before they see them. These birds make low booming noises and long whistles. They live deep in the lowland forests of Colombia, South America. Their favorite hangout is in the trees. Curassows can sometimes be seen dispersing seeds—a nice way of saying pooping out seeds. This might sound gross but it helps keep forests healthy.

**Threats »** Many factors have contributed to a serious decrease of curassow numbers in the wild. Hunting and the loss of habitat are major reasons, but people also used to keep curassows as pets. This took animals out of the wild and prevented them from breeding. Topping off their troubles, curassows don't breed that often to start with—no wonder there are hardly any left!

**Information »** Little is known about the blue-billed curassow. There are only 16 birds living in North American zoos and bird breeding facilities. The Smithsonian's National Zoo has one young male that keepers are studying. Take flight to the Bird House to see one of these endangered birds for yourself. No plane tickets required!

**Reward »** Conservation groups are learning more about the blue-billed curassow and finding ways to breed it in captivity. An organization called ProAves, is leading the conservation efforts. They created a natural reserve in Colombia and promote its importance at an annual blue-billed curassow festival for the local community. North American organizations, like the National Zoo and the Houston Zoo, are also helping to learn more about this endangered species. They hope to breed blue-billed curassows and increase their numbers in the wild. Now, that would be rewarding!

MISSING:  
BLUE-BILLED  
CURASSOWS!

## Who Needs a Pet Curassow?

Make your own blue-billed curassow. You can use it as a puppet, a decoration, or a curly-topped clip!

- Scissors
- Glue
- Colored construction paper or cardboard (black and blue, to be accurate)
- A clothespin
- A googly eye
- Markers
- Pipe cleaners (or curling ribbon)
- Tissue paper

1. Cut the black paper into a head shape and the blue paper into two beak halves (unless you want to change your curassow's colors)
2. Attach the googly eye to the eye spot.
3. Glue the head to the clothespin, just behind the joint. Make sure to glue it to only one of the prongs so that the pin can still open and close. No one likes a closed beak!
4. Glue the top part of the beak to the top prong of the clothespin. Glue the bottom part of the beak to the bottom prong of the clothespin.
5. The clothespin joint should still be showing, so cover it with a small wad of tissue paper, a mini pom pom, a half-marble, or anything else you can find.
6. Create the curassow's beautiful curly head feathers, using pipe cleaners or curling ribbon. Attach with glue or tape.
7. Make your bird come to life—now it can squawk, peck, or bite!





BY MARY-  
RUSSELL  
ROBERSON

{ CONSERVATION STATION }

# Rain, Rain, Go Away

**D**uring a rainstorm, runoff from streets, parking lots, and yards inundates nearby streams. The water carries trash and pollution, and the sudden influx erodes streambanks.

You can help reduce stormwater runoff by creating a rain garden in your yard. When placed in the right location and filled with the right plants and soils, a rain garden soaks up water and filters it slowly into the ground. To avoid water problems in your yard or flooding in your basement, research how to properly plan and install a rain garden. The results can be both useful and beautiful.

**Here are some tips:**

- Spring or fall is the best time to install a rain garden.
- Pick a site at least ten to 15 feet away from your house. This area should be flat or sloping away from the house.
- Draw a layout of your garden. Choose native plants that can survive flooding and that are suited to the available sunlight.
- Mark the outlines of the garden in your yard and dig out about six inches of soil (call your utility company first to check on the locations of buried pipes and cables).
- If the soil in your garden is clay-rich, you may need to add compost and sand.
- Use the excavated soil to build a berm—a raised rim—on the down-sloping side of the rain garden. Top the berm with plants or rocks to prevent erosion.

**For more information:**

- <http://www.dof.virginia.gov/rfb/rain-gardens.shtml>
- <http://www.montgomerycountymd.gov/Content/DEP/Rainscapes/home.html>
- <http://www.bae.ncsu.edu/topic/raingarden>



JESSIE COHEN / NZP

[ RESEARCH REPORT ]



JASON BOURQUE, FLORIDA MUSEUM OF NATURAL HISTORY

# Supersized Snake

Imagine a snake as long as a school bus and as heavy as a small car. If you stood beside the snake, it would have come up to your hip. No such reptile lives on Earth today, but fossil vertebrae of a snake fitting this description were recently discovered in Colombia, South America, by a team that included Smithsonian scientists.

The fossils came from the world's largest open-pit coal mine. Carlos Jaramillo, a staff scientist at the Smithsonian Tropical Research Institute in Panama, his students, and his colleagues have been finding fossils of plants, animals,

and pollen at the mine since 2004. Over the past five years, they've uncovered 150 vertebrae belonging to 28 different specimens of the huge snake, dubbed *Titanoboa cerrejonensis*. In the same vicinity, they also found fossils of large freshwater turtles and crocodiles, which were the likely prey of *Titanoboa*. Taken together, the fossil collection indicates that the area was a tropical rainforest 60 million years ago.

Jaramillo says he hopes to continue collecting fossils from the coal mine for many years, gradually piecing together a more complete picture of the ancient rainforest ecosystem that once flourished there.



## UPCOMING EVENTS

**Sunset Serenades**

July 9, 16, and 23, 6 to 8 p.m.

Spend a summer evening enjoying music at the Smithsonian's National Zoo.

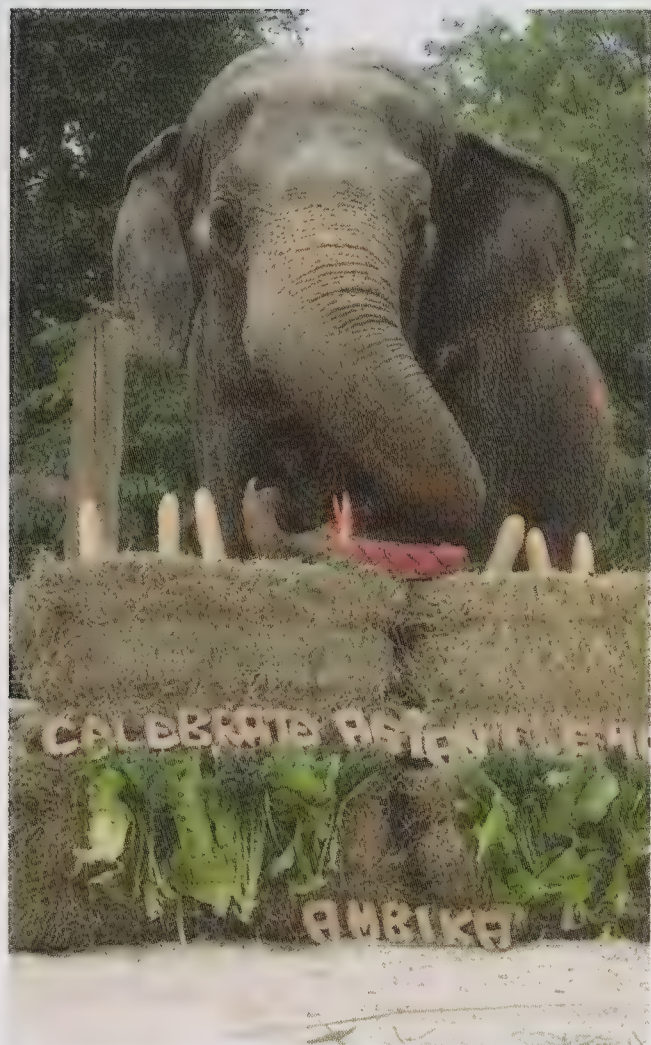
Come to Lion/Tiger Hill for free Thursday evening concerts. On July 9, hear the band called GHZ play "psychedelic blues" in their third year performing at Sunset Serenades.

July 16 brings the Steve Scott Project, with Steve Scott and master percussionist Leroy Greer, who also performed at ZooFari.

On July 23, we welcome Soul in Motion, a dance and drumming group from West Africa. Visit [www.fonz.org/sunsetserenades.htm](http://www.fonz.org/sunsetserenades.htm) for more information.



ELIZABETH WAGNER/NZP



JESSIE COHEN/NZP

**Celebrate Asian Elephants**

August 22, 10 a.m. to 4 p.m.

With the ongoing construction of Elephant Trails, the National Zoo is dedicating significant resources to the conservation of Asian elephants, a species that is rapidly dwindling in the wild. Join us for a day set aside to honor this amazing animal. Visitors can learn about how the Zoo cares for its Asian elephants through special exhibits, demonstrations and hands-on activities. For more information, go to [www.fonz.org/events.htm](http://www.fonz.org/events.htm).



MEGHAN MURPHY/NZP

**Brew at the Zoo,** August 20, 6 to 9 p.m.

Sample beers from more than 20 microbreweries, listen to live music by popular local band Gonzo's Nose, and get a commemorative mug—all for one general admission ticket. Upgrade to a VIP ticket to access a private area featuring hors d'oeuvres, a beer bar, animal encounters, and a Brew at the Zoo T-shirt. Proceeds support animal care, conservation science, education, and sustainability at the National Zoo. For tickets and more details, visit [www.fonz.org/brew.htm](http://www.fonz.org/brew.htm).

## EVENT WRAP-UP

**ZOOFARI** — It was a magical evening of delicious food, wine, music, and mingling. Many thanks to our sponsors: American Airlines, Chevy Chase Bank, The Coca-Cola Company, Comcast, Fujifilm, GEICO, MIX 107.3 FM, NBC4, NewsTalk 630 WMAL, Rosenthal Jaguar/Land Rover of Tysons Corner and Chantilly, Virginia, and True Oldies 105.9 FM. Check out the list of participating restaurants at <http://fonz.org/zoofarirestaurants.htm>

**GUPPY GALA** — How much fun can a kid have in one evening? It was all there at Guppy Gala, sponsored by UnitedHealthcare®. The Zoo's annual evening event for children featured live performances, sports and games, kid-friendly food, and much more. We thank our sponsors: UnitedHealthcare®, The Coca-Cola Company, MIX 107.3 FM, Washington Parent, Yellow Book, and Yelp.

Check this FONZ section in each issue of Smithsonian Zoogoer for important member news about Zoo events, classes, camps, and more. For more information, visit [www.fonz.org](http://www.fonz.org).

## FONZ Resources

Membership information  
202.633.2922

FONZ special events  
202.633.4470

Development office  
202.633.3033

Camps and classes  
202.633.4470

Volunteer service  
202.633.3025

Comments? Questions?  
Please email us at  
[member@fonz.org](mailto:member@fonz.org)

Not a FONZ member yet?  
Call 202.633.3034  
or go to  
[www.fonz.org/join.htm](http://www.fonz.org/join.htm)



# FONZ CLASSES

## ADULT/CHILD CLASSES

» These programs are designed to allow adults and children to discover the Zoo together. All children must be accompanied by an adult. For the safety and enjoyment of everyone, unregistered children and siblings may not attend—with the exception of infants who are not yet crawling.

Children's classes and programs are open to FONZ members at the Household level and higher categories only. All classes meet in the Visitor Center unless otherwise noted.

Register online at:  
[www.fonz.org/classes.htm](http://www.fonz.org/classes.htm).

## Animal Discovery

A wonderful new world unfolds in this six-session introduction to the animal kingdom. Discover reptiles, amphibians, mammals, fish, birds, and invertebrates through lively discussions, handling artifacts, creative crafts, and visits to your favorite animals.

**AGES** 3-5 (with an adult)  
**DATES** Session 1: September 24;  
October 1, 8, 15, 29;  
November 5  
Session 2: September 25;  
October 2, 9, 16, 30;  
November 6  
**TIME** 1-2:30 p.m.  
**FEE** \$100



JESSIE COHEN/NZP



JESSIE COHEN/NZP

## CHILDREN'S WEEKEND WORKSHOPS

» Children's workshops are for kids ages four to 14. Specific ages are indicated in each class listing. Parents are not encouraged to stay with the class, but may if they wish. There is no charge for an adult who attends with a child.

## Amazon Adventure!

Anteaters, monkeys, and capybaras are just a few of the animals that are found in Latin America's forests and lakes. Celebrate Hispanic Heritage Month while learning about the amazing animals that call the Amazon home.

**AGES** 4-5  
**DATES** Session 1: September 19  
Session 2: September 20  
**TIME** 9-11 a.m.  
**FEE** \$28

## Wild Workers

Honor some of the hardest workers around. From eager beavers to leaf cutter ants, these creatures work around the clock to build their homes!

**AGES** 6-9  
**DATE** September 26  
**TIME** 9-11 a.m.  
**FEE** \$28

## Schooling Around

School isn't just for kids—some of the most fascinating fish go to school all year round. Meet the fish who move around in schools, and learn about the predators they are out to fool. No bathing suit required!

**AGES** 4-5  
**DATES** Session 1: September 26  
Session 2: September 27  
**TIME** 9-11 a.m.  
**FEE** \$28



JESSIE COHEN/NZP



**DRINK AND  
STILL FEEL  
GOOD IN THE  
MORNING.**

FRIENDS OF THE  NATIONAL ZOO

**Brew at the Zoo**



**THURSDAY, AUGUST 20, 2000 6:00-9:00 PM**

Have fun while supporting a good cause! Head to the National Zoo, where drinking beer helps save wildlife. At Brew at the Zoo, you can try samplings from area breweries while you rock out to live music. Proceeds support the Zoo's conservation programs. Order tickets at [www.fonz.org/brew.htm](http://www.fonz.org/brew.htm) and join us at Brew at the Zoo. You'll go to bed happy and wake up the same. This is a 21+ event.





MEHGAN MURPHY/ NZP

## A Happy Ending

**Hippos are known for their huge mouths and bodies, not their funny little tails.** "I took this shot of Happy, the National Zoo's hippo, from behind because people can't usually get close enough to a hippo to see what the tail looks like," says Smithsonian's National Zoo photographer **Mehgan Murphy**. "It's surprising that it's covered with bristles."

A Nile hippopotamus marks its territory by vigorously twirling that bristly tail to propel its dung outward. An engineer actually conducted a mathematical analysis of a piece of Happy's projectile dung stuck to the ceiling of his enclosure and calculated that it must have traveled more than 22 feet. Stand back!

### CAPTURE THE SEASONS

Submit your photos to *Smithsonian Zoogoer* for a photo feature that will run in our January/February 2010 issue. Photos should showcase a particular season of the year at the Zoo. Only FONZ members may participate; limit four photo submissions per individual. Please email your photos to [zoogoer@si.edu](mailto:zoogoer@si.edu) by November 10, 2009.

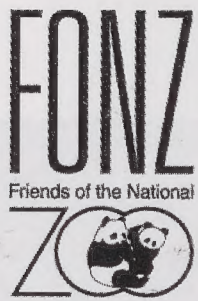




Good day.

Great day.





Friends of the National Zoo, PO Box 37012, MRC 5516, NW, Washington, DC 20013-7012, [www.fonz.org](http://www.fonz.org)

\*\*\*\*\*CAR-RT LOT\*\*C000

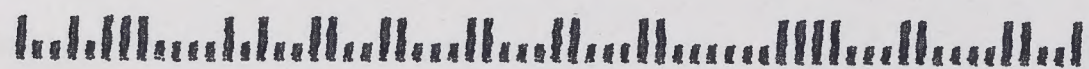
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SMITHSONIAN INSTITUTION ARCHIVES

ARTS & INDUSTRIES- RM 2135

900 JEFFERSON DAVIS DRIVE SW

WASHINGTON DC 20560-0001



Smithsonian  
*National Zoological Park*



**STICK WITH US.**

You love all things with feathers, fur, and fins. We need you on our side. That's why you should renew your FONZ membership before it expires. Not only will you help save endangered wildlife, but you'll keep all the benefits of membership. Plus, you'll receive the new FONZ decal. Stick it on your car and let the world—or at least the cars around you—know that you're stuck on wildlife conservation.